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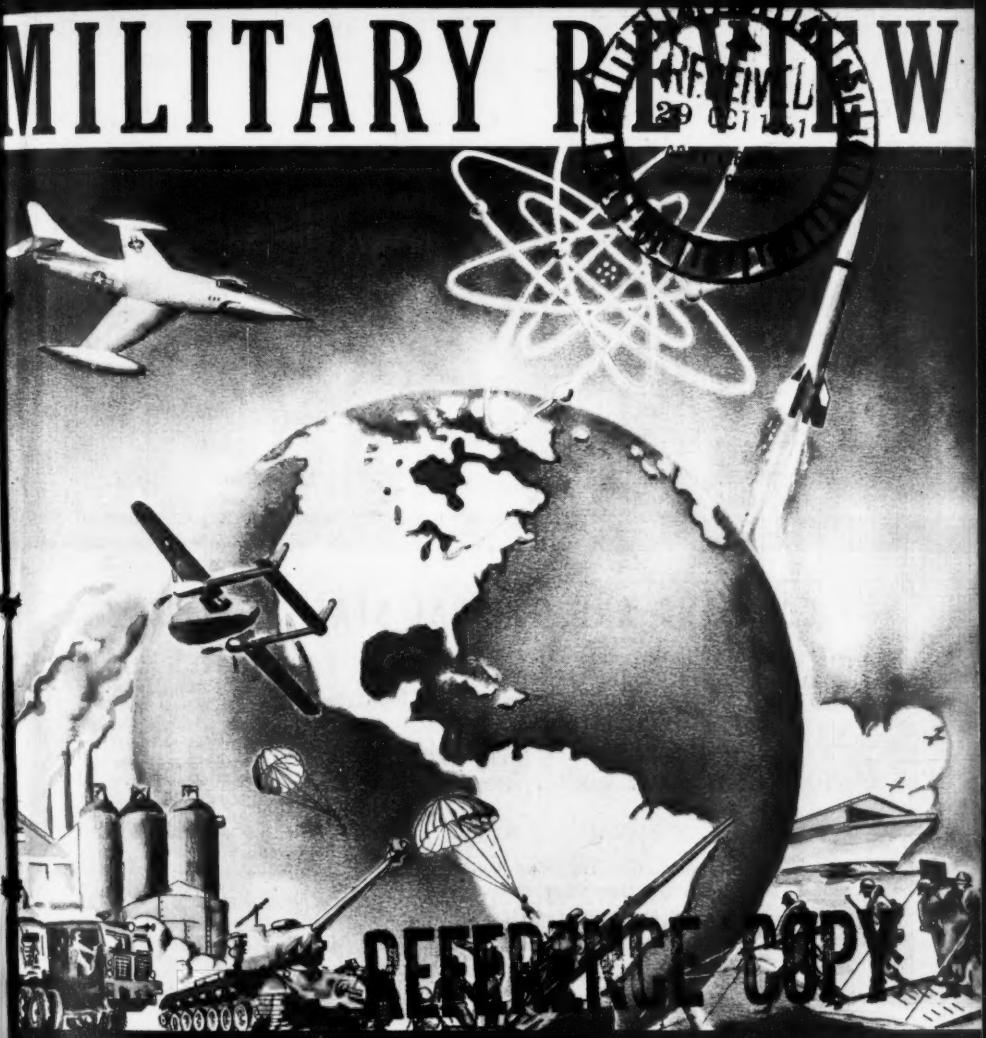

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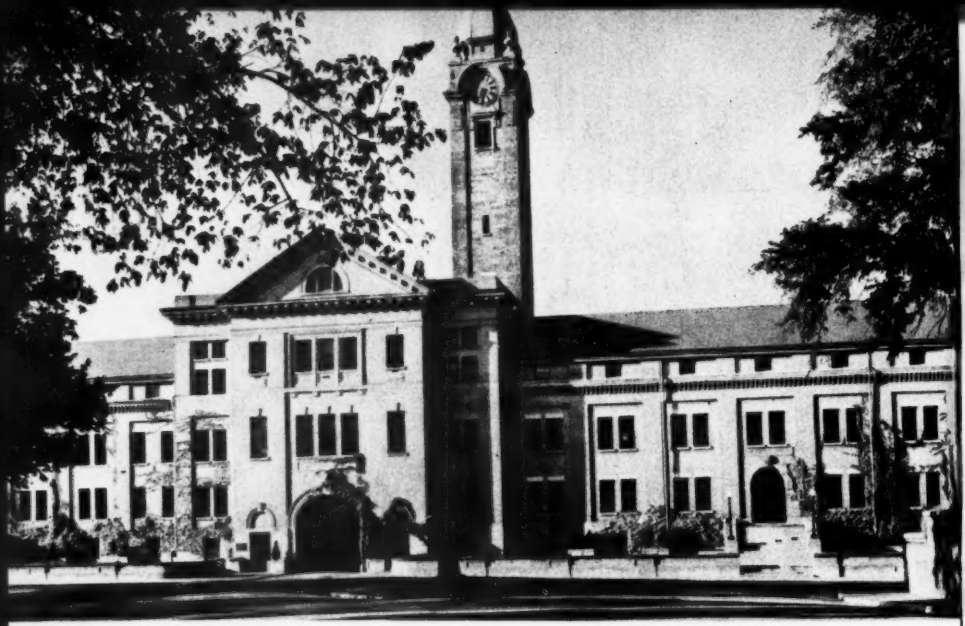
COMMAND AND GENERAL STAFF COLLEGE
FORT LEAVENWORTH, KANSAS

NOVEMBER 1951 VOLUME XXXI NUMBER 8



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MILITARY REVIEW

VOLUME XXXI NOVEMBER 1951 NUMBER 8

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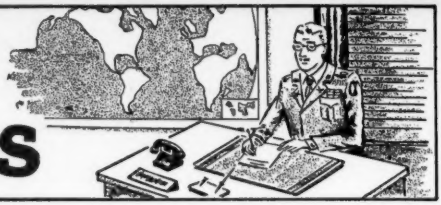
OUR AUTHORS



Major General William H. Middleswart, a graduate of the Army Industrial College (1937) and the Army War College (1938), has been Assistant Quartermaster General and Director, Military Planning Division, Office of The Quartermaster General, from 1947 until his recent assignment to the European Command. In 1941, he became Chief, Quartermaster Special Observer Group, London, England, and the following January was appointed as Chief Quartermaster, European Theater of Operations. After serving as Chief Quartermaster, Atlantic Base Section (1942), he became, respectively, Quartermaster, Services of Supply, North African Theater of Operations; Quartermaster, Mediterranean Theater of Operations; Quartermaster, Southern Line of Communications; and Deputy Chief Quartermaster, European Theater of Operations.

Colonel Lee J. Davis, presently assigned to the Student Detachment, Air War College, served as an instructor at the Command and General Staff College since 1948, when he was graduated from that College. During World War II, he commanded the 478th Antiaircraft Artillery Battalion during the campaigns in New Guinea and the Philippines. Colonel Davis also holds a degree in Commercial Engineering, obtained from the University of Cincinnati in 1930.

Colonel John W. Davis served in the European Theater from 1942 to 1946. Formerly an instructor at the Command and General Staff College and at present assigned to the faculty of the Army War College, he also is the author of "Ports and A-Bombs" which appeared in the October 1950 issue of the MILITARY REVIEW, together with a brief biographical sketch of him.

Lieutenant Colonel Charles W. Matheny, Jr., served in Germany, during World War II, with an artillery battalion, which he eventually commanded. Prior to his recent assignment as a student in the Liaison Pilot Course, for the past 4 years, he had been a member of the planning staff in the Office of the Assistant Chief of Staff, G3, Department of the Army. He is also a graduate of the University of Florida, class of 1936.

Lieutenant Colonel George W. McCaffrey graduated from the Command and General Staff College in 1950, and then was assigned as an instructor at that College. During World War II, he served with the Headquarters, Southwest Pacific Areas (1942-1945). After the war, he was assigned, respectively, to the Headquarters, Replacement and School Command, and the G1 Section, Headquarters, Third Army.

Colonel Mark F. Brennan, during World War II, served as an infantry battalion commander with the 34th Infantry Division in Italy (1943-1944), and in the G3 Section, Headquarters, Army Ground Forces (1944-1946). From 1946 to 1949, he was assigned to General Headquarters, Far East Command. Graduating from the Command and General Staff College in 1950, he then was selected as an instructor at that College.

The Preparation of a Technical Service Mobilization Plan

Major General William H. Middleswart, USA
Headquarters, European Command

This article was adapted from a paper presented to the student body of the Army War College, Fort Leavenworth, Kansas, on 22 May 1951.—The Editor.

AS CHIEF of the Military Planning Division of the Quartermaster Corps, I have a special job. It is the job of "thinking-in-advance." That, of course, is what planning always amounts to, whether it takes place in a military organization or elsewhere. In other words, planning is an organized process of looking into the future and solving, in advance, as many of tomorrow's problems as can be foreseen today.

The one thing we would like to have most in our planning work is time. We have had time in the past—since the disastrous opening of World War II—for this "thinking-in-advance," and I believe the grim lessons of that conflict have steered us into something resembling foresight. We have made advances. But, at the moment, time may well be running out, and speed must now be our watchword. All our military problems are urgent, as I need not remind you.

Fortunately, the main parts of the Army's war mobilization planning have already been thought out. The over-all scheme resembles an elastic bucket which can expand to accommodate whatever may be poured into it. Whether or not this bucket bursts at the seams or spills over the top is up to you and me. No one in the Army is exempt from the responsibility of seeing to it that the plan works. To greater or lesser degree, we all are affected *by* it, and involved *in* it.

But we will surely fail if we see nothing in front of us but a piece of paper. On the contrary, we must see something required of us; something that must be done. For it is true that any plan, on the basis of which nothing happens, is worthless.

Last year, while working on the Quartermaster aspects of airborne operations, I discussed our planning problems with Major General James Gavin, the leader of several celebrated airborne operations during the war. General Gavin said: "We must tackle our planning with all the energy and enthusiasm and imagination we have."

I would like to apply his remark here. Energy and enthusiasm we already have. What about imagination? This rarest of all qualities of the human mind is not

A mobilization plan is a war plan in which, starting from limited peacetime capabilities, we provide for a rapid transition to a war footing. To a greater or lesser degree, all are affected by it and involved in it

always on call. Only great leaders have had it—the ability to see all around the bush, to see the whole problem in its entirety.

Visualize the Plan

In following the various steps and actions inherent in the preparation of a Technical Service Mobilization Plan, I will ask you to visualize the plan not as a piece of paper but as a collection of individual actions by various men. I suggest that you put yourselves in their places, beginning with the Joint Chiefs of Staff at the Pentagon and ending with Recruit John Jones.

Needless to say, all war plans and mobilization plans and programs support each other and depend on each other. As actions, they are all carried forward at the same time and they must be of such nature and structure that they do not get in each other's way. No one of the procedures can be said to be the controlling factor of the planning system; a balance must be maintained in the proportionate effort which each bears to the whole.

Since the Army's ultimate usefulness, and, in fact, the only excuse for its existence, is the waging of war, it follows that any Army plan whatever is, in essence, a war plan, no matter what its nature may be. All such plans must *start* from our limited peacetime capabilities. We make such provisions as we can for a rapid transition from a peace to a war footing.

Army Planning Program

Figure 1 tells us what we, and by we I mean the Department of the Army, must do in order to solve the problems of planning for war under peacetime limitations. We are called upon to develop:

First, a war plan for the conduct of military operations; that is, decide what we will do as a shooting outfit if war starts.

Second, a mobilization plan which will support the shooting-war plan with manpower and matériel.

Third, programs for the peacetime operation of the Army. By that I mean a system for rapidly expanding our forces and facilities, based on our capabilities.

This is long-range planning. What guides it?

Relationship of Plans

Figure 2 shows the steps of guidance.

The Joint Chiefs of Staff War Plan assumes a date of execution, projected into the future, based on a reasonable prediction of the next war's beginning. It is a summary, so to speak, of the *when-where-what* of the Nation's striking power, restricted by an estimate based on the limitations of the national economy, the political situation, and the most probable nature of war at that time.

Remember, we are discussing *mobilization.* Now, one of the first steps in this planning category is the establishment of a Joint Chiefs of Staff Mobilization Plan. While this is a step down from the Joint Chiefs of Staff War Plan, it, too, is fundamental, and from it stem the mobilization plans of the Army, the Navy, and the Air Force.

A directive follows, from the Joint Chiefs of Staff, requiring that the three armed services make their own mobilization plans and requiring, further, that these plans tie in effectively with the over-all mobilization plan. In support of the Joint Chiefs of Staff War Plan, an Army Outline Emergency War Plan is developed. This furnishes guidance for the formulation of an Army Emergency *Operational* Plan, and, at the same time, it furnishes guidance for developing the Army Mobilization Plan itself.

Once this Army Mobilization Plan is developed, it serves as a directive to all Army commands, including the Technical Services, giving them the job of planning, individually, their own mobilization. The

ARMY PLANNING PROGRAM
Solved
WAR PLAN FOR THE CONDUCT OF MILITARY OPERATIONS.
MOBILIZATION PLAN SUPPORTS THE WAR PLAN WITH MANPOWER AND MATÉRIEL.
PROGRAMS FOR THE PEACETIME OPERATION OF ARMY.

FIGURE 1.

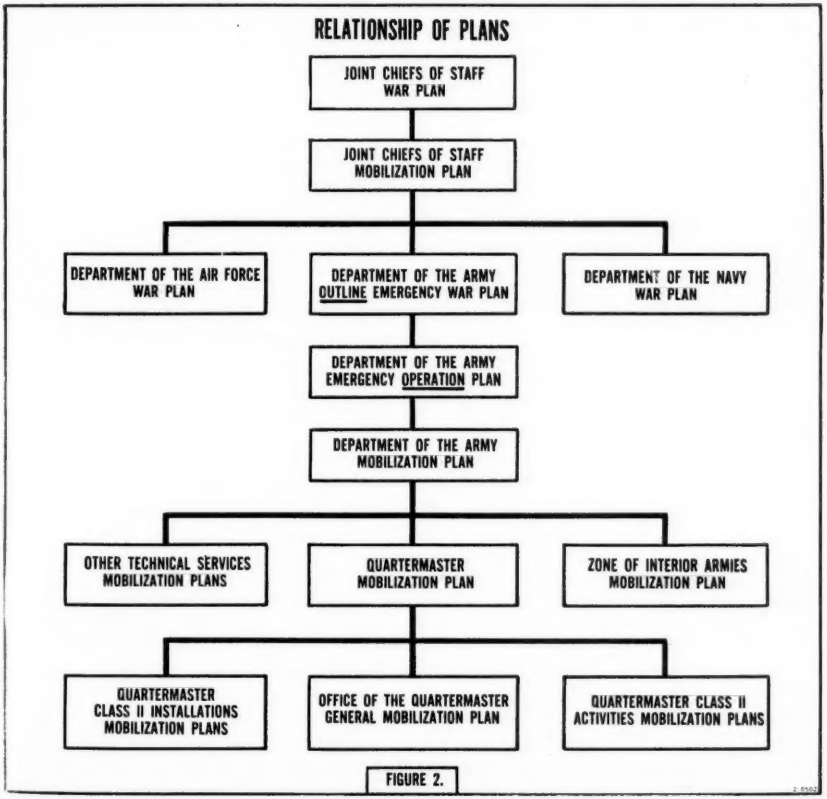

RELATIONSHIP OF PLANS
JOINT CHIEFS OF STAFF WAR PLAN
JOINT CHIEFS OF STAFF MOBILIZATION PLAN
DEPARTMENT OF THE AIR FORCE WAR PLAN
DEPARTMENT OF THE ARMY OUTLINE EMERGENCY WAR PLAN
DEPARTMENT OF THE NAVY WAR PLAN
DEPARTMENT OF THE ARMY EMERGENCY OPERATION PLAN
DEPARTMENT OF THE ARMY MOBILIZATION PLAN
OTHER TECHNICAL SERVICES MOBILIZATION PLANS
QUARTERMASTER MOBILIZATION PLAN
ZONE OF INTERIOR ARMIES MOBILIZATION PLAN
QUARTERMASTER CLASS II INSTALLATIONS MOBILIZATION PLANS
OFFICE OF THE QUARTERMASTER GENERAL MOBILIZATION PLAN
QUARTERMASTER CLASS II ACTIVITIES MOBILIZATION PLANS

FIGURE 2.

Army plan, while putting the Technical Services onto the job, provides, in its structure, the basis for the development of their mobilization plans, which we will consider, presently, in some detail.

Army Mobilization Plan

The Army Mobilization Plan, please bear in mind, provides for *more* than the basis of Technical Service mobilization planning. It provides for the mobilization and training of all units and personnel required to meet war plans, including plans for the defense of the Zone of Interior.

It sets forth the basis of industrial mobilization planning; and, finally, it also indicates the objective toward which the Army should direct its activities in peacetime; in brief, preparedness.

Quartermaster Mobilization Planning

My discussion is concerned with the development of a Technical Service Mobilization Plan in general but, more specifically, the development of the Quartermaster Mobilization Plan. Our plan is typical of all the others.

As you are well aware, the broad mission of the Quartermaster Corps is to feed and clothe the soldier; to provide certain other supplies such as equipage and POL; to furnish him with certain specialized services, such as aerial resupply and laundry and bath facilities; and to provide for the disposition of the remains of deceased military personnel. Certain of these services we furnish to the Navy and the Air Force as well.

As to our mobilization planning, The Quartermaster General has assigned the task to the Military Planning Division. This division, therefore, directs and supervises those Quartermaster Corps planning activities which stem from the directive we have received with the Army Mobilization Plan.

Type of Problem to be Solved

In determining the amount of storage space required to support the phased troop strengths as set forth in the Army Mobilization Plan, we must be sure that this space requirement not only is adequate for the supplies involved, but that it is geographically located to furnish the maximum support to both the continental army areas and the overseas commands as well.

Depots must have adequate transportation facilities and are located in railroad centers. Adequate rail facilities are the first requisite.

In arriving at these requirements, we must include not only the Quartermaster storage space requirements, but those of the other Technical Services at general depots as well. While figures as such may be meaningless to the layman, the plan includes the necessary detailed calculations, for in it, we try to include all the answers.

Each Technical Service, of course, has to decide what basic rules it will set up and what actions it will take in order to form an effective mobilization plan. In the *ascending* scale, plans are more and more general in context. At the top, the Joint Chiefs of Staff War Plan is a very concise document covering over-all strategy.

The Quartermaster Corps, in the development of *its* detailed plan, is governed by the guidance and assumptions set forth in the Army Mobilization Plan.

Quartermaster Mobilization Plan

While physically a separate document, as are all the Technical Service plans, the Quartermaster Mobilization Plan, when completed and approved by the Department of the Army, becomes an integral part of the Army Mobilization Plan. As such, these plans form the basis for the development of the mobilization plans of the subordinate commands and agencies of the Department of the Army.

We have, I believe, traced the successive lines which have led us to the foundation on which a Technical Service Mobilization Plan is erected, and the position which that plan, when completed and approved, occupies in the planning picture.

Our current plan generally follows the format of the Army Mobilization Plan adjusted to suit our particular requirements. I should like to give you an idea of the contents of our plan. To do this, let me give you a word picture of the current plan.

The first few pages of the plan are general in nature and set forth the purpose, basis, and assumptions of Quartermaster mobilization planning.

This section establishes the means of implementation and provides for the development of subordinate plans by Quartermaster Class II installations. Furthermore, in the two appendices to this portion of the plan, detailed instructions for the preparation of subordinate plans and supporting action folders are set forth.

Physically, the remainder of the Quartermaster Mobilization Plan is divided into a series of annexes.

The *Personnel Annex* furnishes the guidance for the development of detailed personnel plans which will, in the event of mobilization, provide, within the ceilings imposed, military and civilian personnel capable of accomplishing the mission of the Quartermaster Corps.

In other words, this annex tells each of our installations how many people will be available to that installation at any given time to accomplish its mission, and establishes ground rules for the use of these personnel.

The *Intelligence Annex* outlines the Quartermaster intelligence objectives and actions necessary to meet the requirements of mobilization.

The third annex in the Quartermaster Mobilization Plan is the *Training Annex*. In it is sufficient information for our installations, the Army Field Forces, and the army commanders concerning the basic policies of The Quartermaster General in the training of individuals and units for which The Quartermaster General has training responsibility.

The over-all *Logistics Annex* comes next. This annex is broken down functionally into the Supply, Procurement, Service, and Research and Development Plans. The individual plans set forth in detail our responsibilities under mobilization for these various functions.

For example, the Supply Plan tells the individual depot commanders their mobilization missions in detail, and the Service Plan tells them how much storage space is planned for each depot. This annex also reiterates Quartermaster policies in the fields of procurement, food service, graves registration matters, and in research and development.

The final annex in our mobilization plan is the *Budget and Fiscal Annex*. The subject matter of this annex is obvious from its title.

Mobilization Planning Objectives in the Technical Services

At this point you may well wonder what the end objectives of mobilization planning in the Technical Services may be. Figure 3 gives you the answer. They are:

First, the phased organizing, training, equipping, and deployment of service troops in support of the forces required to accomplish the Army's tasks.

Second, the furnishing of the required information for use in computing detailed mobilization requirements in the assigned areas of responsibility of the Technical Service.

I repeat, that the mobilization plan of the Quartermaster Corps gives detailed guidance and information, within the zone of our own responsibility, to the various subordinate Quartermaster commands.

Let me illustrate this concept using the

Fort Worth Quartermaster Depot as a case in point. Through the Quartermaster Mobilization Plan, the depot commander learns his mobilization mission, the ceiling imposed on him for hiring personnel, and the space allocated to him either by the utilization of existing space, hiring commercial warehouse space, or by new construction.

In addition, he has been informed of the mobilization policies of the Quartermaster Corps. With this information, it now becomes *his* responsibility to develop a detailed plan for his installation which will serve as a guide to him, or his successor, in the accomplishment of his mobilization mission. The installation mobilization plan will show what will have to be done throughout the mobilization period, and, generally, how it will be accomplished.

It will set forth, in detail, the plans for personnel expansion; space expansion; the requirements for the additional equipment necessary to accomplish the additional workload of mobilization; and the additional security measures which will be required at the installation. These are but a few of the items that the detailed mobilization plan for the installation will cover. Our plan, in addition to furnishing this detailed guidance and information to our own subordinate commands, gives the continental army commanders information relative to the Quartermaster Corps' policies, and specific data pertaining to the missions of the Quartermaster installations located within each army area.

Troop List

One of the most important aspects of mobilization planning is the preparation of a Technical Service Troop List showing those service troops required to support the combat forces, the deployments, and the missions which form a part of the underlying strategic concept.

The directive part of the Army Mobilization Plan furnishes us with certain basic assumptions and planning data for our guidance. For example, the directive will assume the existence of an active Army of specific size and composition on M-day. This active Army might be the Army as it existed on the date of the directive, or the Army it is assumed will exist "X" months later—the equivalent of an assumption that M-day will occur at a certain time in the future.

This directive sets forth the increasing strength of the Army from the assumed M-day strength to the maximum which it is planned to reach. The build-up normally is time-phased by month or quarter. It is broken down, at each period, to show the strengths of combat forces, the troop pipe-line situation, the Zone of Interior operating personnel, and the service personnel of each Technical Service.

This directive, furthermore, will list the number, type, and deployment of major combat elements and, at the same time, will give us the time-phased over-all populations for each theater of operations.

We will receive, in this same directive, less detailed data of a similar nature pertaining to the Navy and the Air Force, since it will be necessary for us to determine the Quartermaster support for the Navy and the Air Force in accordance with current directives.

Guidance Yardstick

The net effect of the guidance given us in this directive is to furnish the Quartermaster Corps with a yardstick by which we can estimate how many of each Quartermaster type units will be required, when they will be required, and where they will be required, in order that we can discharge our responsibilities under the basic strategic concept of the Joint Chiefs of Staff.

This yardstick, in reality, represents quantities; but these "quantities" represent capabilities, based on the troops we have rather than those we wish we had.

The reason for this is that this yardstick is modified and limited by troop ceilings allotted to us by the Department of the Army; and it is further modified and limited by such factors as the availability of troop housing, training facilities, and the capability of the Quartermaster Corps to build up a training organization quickly after M-day.

The computations involved in determining the number and type of Quartermaster troops required to support the combat forces is a complicated one. It is too involved for me to discuss here in detail. The support capability of each Quartermaster unit is set forth in the Tables of Organization and Equipment.

The tables indicate, for example, how many tons of supplies can be handled or the number of pounds of bread which can be baked in a given period. These factors are applied against the number of troops to be supported and the result is the number of Quartermaster units of a particular type which are required. This is just one factor used—other factors include the dispersion of forces to be supported, climatic and terrain conditions, and the character of particular operations.

Training

The result will be a phased troop list of Quartermaster Table of Organization and Equipment units. It now remains for us to decide where these units will be trained. This can be determined only by a look at the facilities and housing spaces at the various Army installations which have been allocated to us by the G4, Department of the Army.

Next, the troop basis will be expressed in terms of a phased training load throughout the mobilization period. This training load will provide for basic training in Replacement Training Centers, unit training, specialist training by military

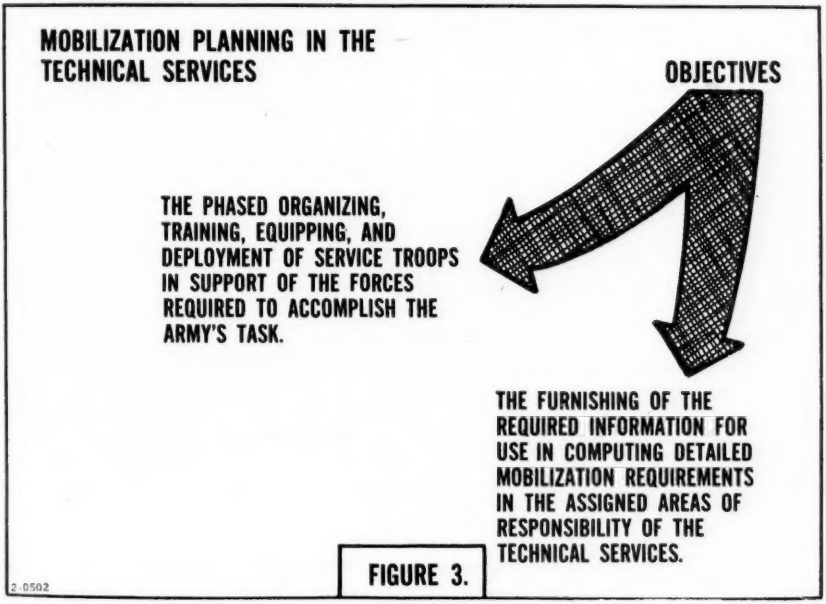

MOBILIZATION PLANNING IN THE TECHNICAL SERVICES
OBJECTIVES
THE PHASED ORGANIZING, TRAINING, EQUIPPING, AND DEPLOYMENT OF SERVICE TROOPS IN SUPPORT OF THE FORCES REQUIRED TO ACCOMPLISH THE ARMY'S TASK.
THE FURNISHING OF THE REQUIRED INFORMATION FOR USE IN COMPUTING DETAILED MOBILIZATION REQUIREMENTS IN THE ASSIGNED AREAS OF RESPONSIBILITY OF THE TECHNICAL SERVICES.
2-0502

FIGURE 3.

occupational specialty in schools, and "on-the-job" training by military occupational specialty.

This training load will include not only the requirements for Quartermaster personnel, but also the training of individuals, by military occupational specialty, for other segments of the Department of the Army, for the Navy, and the Air Force.

For your information, the Quartermaster Corps trains both officer and enlisted personnel for the Department of the Navy in the fields of food service, bakery management, tailoring, shoe repairing, office machine repairing, and subsistence procurement.

Similar training is provided officer and enlisted personnel of the Air Force. Training requirements in these fields are co-ordinated between the Navy and Quartermaster Corps by the Office, Chief, Army Field Forces.

The bulk of the replacement training load of the Quartermaster Corps will be accomplished at the Quartermaster Center, Fort Lee, Virginia.

The training load, when finally determined, plus the requirements for manning depots and other Quartermaster Class II installations and activities, provide a basis for determining the requirements for Table of Distribution or overhead units.

This constitutes the fourth and final step in the preparation of our mobilization troop basis.

Co-ordination Between the Quartermaster Corps and the Other Services

In the development of our mobilization plan, close co-ordination between the Quartermaster Corps, the other Technical Services, the General Staff, the Navy, and the Air Force is essential. Figure 4 depicts the major areas in which this co-ordination is required.

The General Staff, United States Army, furnishes over-all guidance, confirms the validity of Quartermaster assumptions, and approves the troop basis and storage requirements.

The Air Force furnishes phased troop strengths and proposed locations.

The Corps of Engineers *is furnished* proposed Quartermaster construction requirements for mobilization.

The Navy furnishes phased troop strengths and proposed overseas locations ashore.

The Surgeon General *is furnished* Quartermaster requirements for veterinary personnel.

The Transportation Corps is consulted for proposed port locations and rail facilities.

And finally, all the Administrative and Technical Service requirements for general depot storage space and personnel are furnished the Quartermaster Corps by all these services.

Quartermaster Storage Space Requirements

Utilizing the troop basis developed by the Department of the Army, in conjunction with the Army Mobilization Plan, the phased troop strengths are converted into the tonnages of Quartermaster supplies required to support this troop strength.

This tonnage then is converted into storage space requirements and evaluated in terms of existing depots, their locations, physical characteristics, and the troop deployment both in the Zone of Interior and overseas.

Typical Co-ordination

Figure 5 illustrates a typical problem of co-ordination. The Quartermaster General is responsible for the administration of the general depot system for the Department of the Army. The impact of full mobilization is significant. The Quartermaster General requests each Technical Service to submit its phased

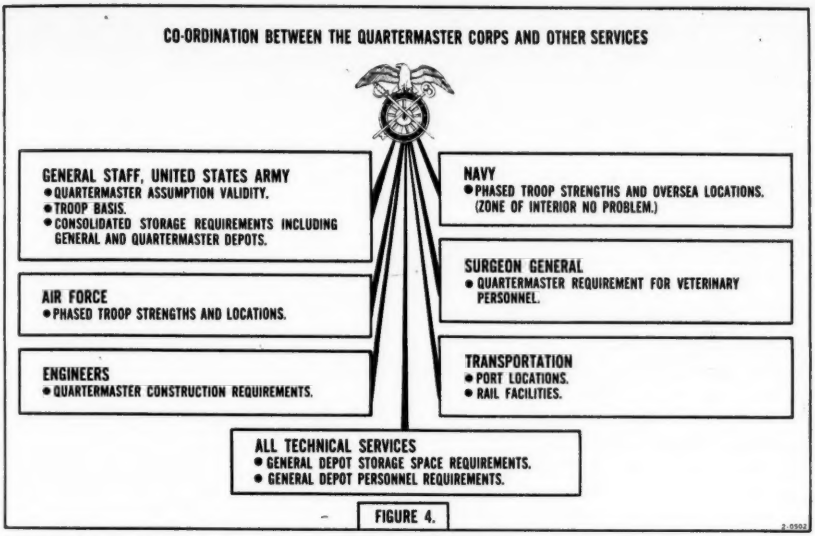

CO-ORDINATION BETWEEN THE QUARTERMASTER CORPS AND OTHER SERVICES
GENERAL STAFF, UNITED STATES ARMY
• QUARTERMASTER ASSUMPTION VALIDITY.
• TROOP BASIS.
• CONSOLIDATED STORAGE REQUIREMENTS INCLUDING GENERAL AND QUARTERMASTER DEPOTS.
AIR FORCE
• PHASED TROOP STRENGTHS AND LOCATIONS.
ENGINEERS
• QUARTERMASTER CONSTRUCTION REQUIREMENTS.
NAVY
• PHASED TROOP STRENGTHS AND OVERSEA LOCATIONS. (ZONE OF INTERIOR NO PROBLEM.)
SURGEON GENERAL
• QUARTERMASTER REQUIREMENT FOR VETERINARY PERSONNEL.
TRANSPORTATION
• PORT LOCATIONS.
• RAIL FACILITIES.
ALL TECHNICAL SERVICES
• GENERAL DEPOT STORAGE SPACE REQUIREMENTS.
• GENERAL DEPOT PERSONNEL REQUIREMENTS.

FIGURE 4.

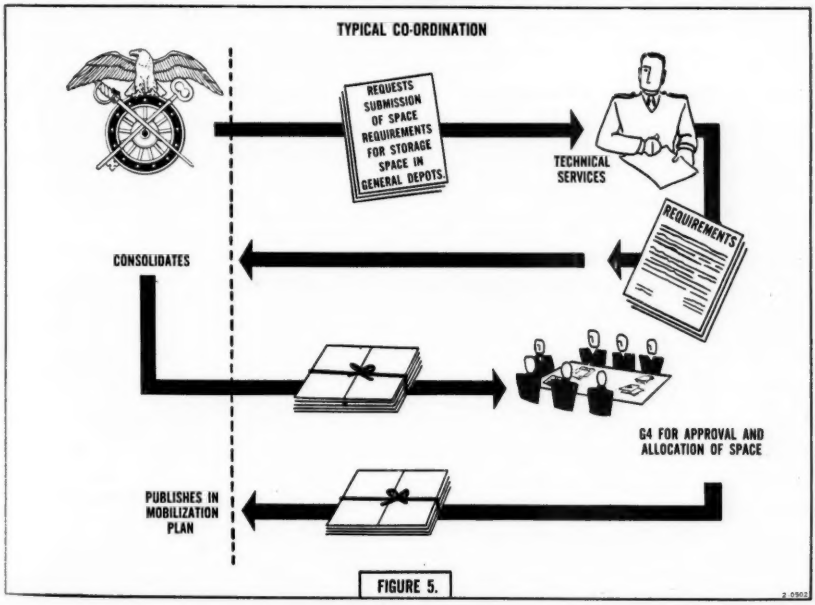

TYPICAL CO-ORDINATION
REQUESTS SUBMISSION OF SPACE REQUIREMENTS FOR STORAGE SPACE IN GENERAL DEPOTS.
TECHNICAL SERVICES
REQUIREMENTS
CONSOLIDATES
G4 FOR APPROVAL AND ALLOCATION OF SPACE
PUBLISHES IN MOBILIZATION PLAN

FIGURE 5.

storage space requirements at general depots.

The Quartermaster General then consolidates these requirements, submits them to the G4 for approval, and publishes them in the Quartermaster Mobilization Plan. If these storage space requirements show that a concentration of troops in a particular area cannot be supplied efficiently from an existing depot, a suitable location for the establishment of a new depot is recommended to the G4.

Personnel Requirements

In this same planning area; that is, for the depot system, there is another problem of co-ordination which concerns the personnel requirements of the other Technical Services. The Technical Services submit to us their personnel requirements for those general depots where they have supply missions. The Quartermaster Corps then budgets for the personnel of the other Technical Services and for the overhead requirements as well.

Quartermaster Procurement Plan

In the field of procurement, Quartermaster mobilization planning also is based on the guidance contained in the Army Mobilization Plan. Our procurement plan provides the basis, policies, and the principles which the Quartermaster Corps will pursue with respect to its procurement responsibilities. It further provides for the development of mobilization procurement plans by field procurement offices in order for them to achieve the highest possible degree of readiness for M-day.

Quartermaster Procurement Organization

The procurement plan develops, in detail, the organization for procurement both within the Office of The Quartermaster General and the field. This organization (Figure 6) includes the *central purchasing offices* responsible for Quartermaster procurement on a commodity basis and the *field offices* to administer the contracts placed by the central purchasing offices. Also shown is the extent of the centralized *inspection service.*

The procurement of perishable food items for the Army, the Navy, and the Air Force under mobilization conditions will continue to be accomplished through the Quartermaster Market Center System, based on domestic and overseas requirements.

The development of our distribution plan, or supply plan as we know it, ties in closely with the development of the procurement plan and depot space requirements. The missions to be assigned to each of the existing depots, and the proposed depots under mobilization conditions, are set forth in this portion of the plan.

I might say here that the mission of a depot involves more than the receipt, storage, and shipment of all types of Quartermaster supplies.

A depot mission may include such activities as base maintenance shops, the classification of returned matériel, the manufacture of selected items, the procurement of specialized items, the processing of lend-lease supplies, and the storage of strategic materials.

Outgoing Co-ordination

I have discussed the co-ordination with the other Technical Services in the preparation of certain portions of the Quartermaster Mobilization Plan, but have indicated only "incoming" co-ordination. However, in the development of the service portion of our plan, we have "outgoing" co-ordination, not only with the other Technical Services, but also with the Army Field Forces, and the army commanders.

For example, we determine the amount of laundry and dry cleaning facilities which will be required at ports, camps,

FIGURE 6.

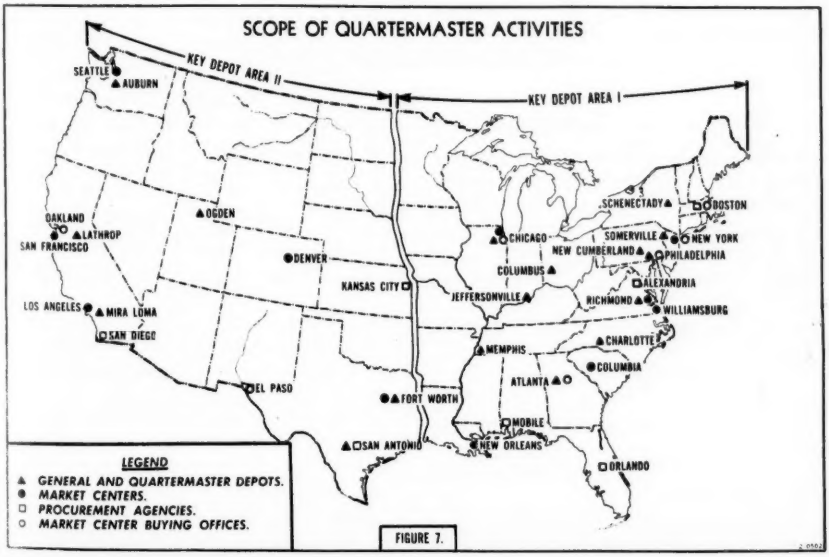


FIGURE 7.

and stations throughout the continental United States. These amounts are furnished the Corps of Engineers who budget for the equipment requirements.

Close co-ordination is required with the Army Field Forces on remount activities because of the interrelated responsibilities for the procurement and training of animals and the training of handlers.

Co-ordination with the Navy and the Air Force is required to plan adequately for the handling of personal effects, since, under mobilization conditions, the Quartermaster Corps has the responsibility for the establishment of a Personal Effects Agency to serve all three services.

In the field of food service, the Quartermaster Corps is responsible for rendering advice and assistance to the army commanders. Mobilization conditions will only increase this activity.

Another important aspect of our mobilization plan pertains to the Graves Registration Service. The Quartermaster General will be responsible, under mobilization conditions, for the supervision and co-ordination of graves registration and burial activities for the Army, the Navy, and the Air Force.

Quartermaster Intelligence

While Quartermaster intelligence activities are limited, there is a strong tie-in between the G2, Department of the Army, the army commanders, and the Office of The Quartermaster General in intelligence matters. Quartermaster intelligence activities involve technical intelligence on items of Quartermaster interest, and the institution of countersubversive measures within the Office of The Quartermaster General.

Similarly, all Quartermaster installations establish a program of countersubversive measures under the continental army commanders.

Quartermaster Research and Development

The research and development activities of the Quartermaster Corps are reflected in the mobilization plan. Basic guidance stems from the Army Mobilization Plan, and the co-ordination of research and development planning on Quartermaster type items is effected not only with the Army, the Navy, and the Air Force agencies, but with civilian scientific and industrial leaders.

Quartermaster Installations and Activities

I think you might be interested, at this point, in seeing very briefly the extent of the major Quartermaster installations which play such an important part in the accomplishment of the mission of the Corps, both in peace and under mobilization conditions.

Figure 7 gives you an idea of the nation-wide coverage our depot system now gives us.

There are 10 general and 7 Quartermaster depots through which flow the 70,000 items for which the Quartermaster Corps is responsible.

It also indicates the extent of the Market Center System with its headquarters in Chicago. It is through this system, together with its field buying offices, that the perishable food requirements for the Army, the Navy, and the Air Force are procured.

Further, Figure 7 indicates the major Quartermaster centralized procurement agencies located at New York, Chicago, Oakland, Atlanta, Philadelphia, and Boston responsible for the procurement of nonperishable subsistence, clothing, equipment, and general supplies for the Army, and the Air Force, and similar type items required for civilian and foreign aid.

Summary

In summary, then, we have seen:

First.—That the mobilization plans of the Joint Chiefs of Staff and the Department of the Army form the *basis* for the

development of the Quartermaster Corps Mobilization Plan.

Second.—That the development of the Quartermaster Mobilization Plan requires detailed *co-ordination* not only within the Quartermaster Corps, but also with the General Staff, other Technical Services, the Navy, the Air Force, the Army Field Forces, and continental army commanders.

Third.—That the Quartermaster Mobilization Plan provides the basis for the preparation of detailed *supporting plans* by subordinate Quartermaster commands.

Fourth.—That the Quartermaster Mobilization Plan furnishes *information* to the General Staff, the Navy, the Air Force, the Army Field Forces, and army commanders relative to Quartermaster Corps mobilization policies.

AND FINALLY.—That the Quartermaster Corps Mobilization Plan is an effort, on the part of the Quartermaster Corps, to look into the future and solve Quartermaster Corps mobilization problems before they *actually* arise.

NEXT MONTH

Main Articles

UDT Pays Off by Lieutenant Colonel John E. Robb; and *Can We Defend the Middle East?* by Captain B. H. Liddell Hart are included among the main articles.

Foreign Military Digests

The foreign digests include "The Present Yugoslav Army: The Major Preoccupation of Western Europe" from the *Revue Militaire Suisse* (Switzerland); and "Balanced Forces for the West" from the *Journal of the Royal United Service Institution* (Great Britain).

Books for the Military Reader

Reviews of *Defense Without Inflation* by Albert G. Hart; and *Balkan Caesar: Tito vs. Stalin* by Leigh White are included.

Map Maneuvers

Their Preparation and Conduct

Colonel Lee J. Davis, *Artillery*
Student, Air War College

MAP maneuvers afford the military student the most advanced type of instruction which is obtainable in the classroom.

No other method of indoor instruction more closely approaches actual field conditions, nor does any other teaching device offer as much opportunity for the development of command and staff teamwork.

What is a map maneuver? The best definition of this form of instruction is found in Special Regulations 320-5-1 *Dictionary of United States Army Terms*, dated August 1950, which defines the map maneuver as: "An exercise in which military operations with opposing sides are conducted on a map, the troops and the military establishments being represented by markers, or symbols, which are moved to represent the maneuvering of troops on the ground." In short, opposing sides play against each other, with their play regulated or controlled by a group of umpires.

The purpose of a map maneuver is to apply doctrine which has been studied previously.

Map Maneuvers Presented at the Command and General Staff College

As evidence of the value and importance of this instructional medium, the following map maneuvers were presented at the Command and General Staff College in the academic year 1950-51:

MM1—Infantry division operations. Blue attacks, Red defends, and the Red counterattacks. Type: a two-sided, free maneuver.

MM2—Infantry division operations. Blue attacks at night and Red defends. Red then attacks and Blue defends. Type: a two-sided, free maneuver.

MM3—Armored division operations. This concerns the play of the corps reserve in a defense. Type: a one-sided, free maneuver.

MM4—Corps operations. This is the play of a corps advancing to contact. Type: a two-sided, free maneuver.

MM5—Base section operations. The play involves a typical day of operations in a communications zone section. Type: a one-sided, controlled maneuver.

MM6—Preparation for the offensive. The play: an advance section's and an army group's co-ordinated planning activities. Type: a one-sided, free maneuver.

MM7—Army operations. This maneuver illustrates the development of retrograde movements on an army level. Type: a one-sided, controlled maneuver.

Types

Essentially, there are two types of map maneuvers; one-sided and two-sided. Either of the two types may be *free* or *controlled*. In the one-sided maneuver, friendly troops are represented by a player group while the umpires represent the enemy. The two-sided exercise requires players for each side and is more complex in structure and technique. The two-sided maneuver creates better learning situations because of the interest gen-

erated through competition between the opposing forces. This type is better adapted to the application of command and staff principles and techniques because of the greater variety of situations which may be employed, and because greater freedom of action may be permitted. The two-sided maneuver, however, has an inherent disadvantage in that the director has less opportunity to mold the action in order to bring out selected instruction.

A *controlled* maneuver is regulated or guided by prefabricated messages prepared for issue on a prearranged time schedule, with the outcome of the actions of the players determined before play begins.

In a *free* maneuver, there is no artificial regulation of the action. The players are placed in a situation, a requirement is indicated, and the maneuver is started. The action then depends upon the opposing forces and the umpires.

Players

The assignment of players depends upon the subject of the maneuver. For example, in an infantry division maneuver, assignments are made to provide the commanding generals, chiefs of staff, the general staffs and assistants as required, and the special staffs. In many cases, it is advisable to combine several special staff assignments under one player.

How do players proceed with their various tasks? The best results are obtained when players conduct themselves during the maneuver as if they were performing similar duties in an actual operation. Players representing commanders make estimates, decisions, and see that orders are issued through the proper command channels. Players assigned to the general staff co-ordinate the work of those special staff officers whose functions they supervise. Players representing special staff officers are the technical and administrative advisers to the commander.

Red division commander outlines a phase of the operation to members of his staff. An instructor listens to the presentation.

Umpires

How do the umpires function? *The Umpire Manual,* Field Manual 105-5, is the basic text and guide for all umpires. Umpires, in map maneuvers, represent all echelons that are superior, subordinate, and adjacent to the players. In one-sided maneuvers, the umpires also represent the enemy. The principal duty of the umpires is to evaluate the orders and decisions of the players. This evaluation is not delivered as such, to the players, but is reflected in orders, messages, and information to them. Umpires make decisions, issue orders, and effect staff coordination. Thus, the umpires are well repaid for their time and effort. They

Map maneuvers have a definite place in the curriculum of the military student. Their use affords an excellent opportunity for training in command and staff activities, as well as building the concept of teamwork

have their counterpart in actual operations, since they represent the headquarters and installations not represented by the player group.

In a division map maneuver, the umpires represent the commanders of the battalions and regiments of the division, corps and army headquarters, and adjacent units. They must use their imaginations to react realistically and portray to the players the effects of decisions, plans, and orders. Umpires should not influence the players in abnormal ways such as by disagreeing with solutions. They accept the actions of the players, and influence the operations by reacting in the same manner as commanders and troops in the field.

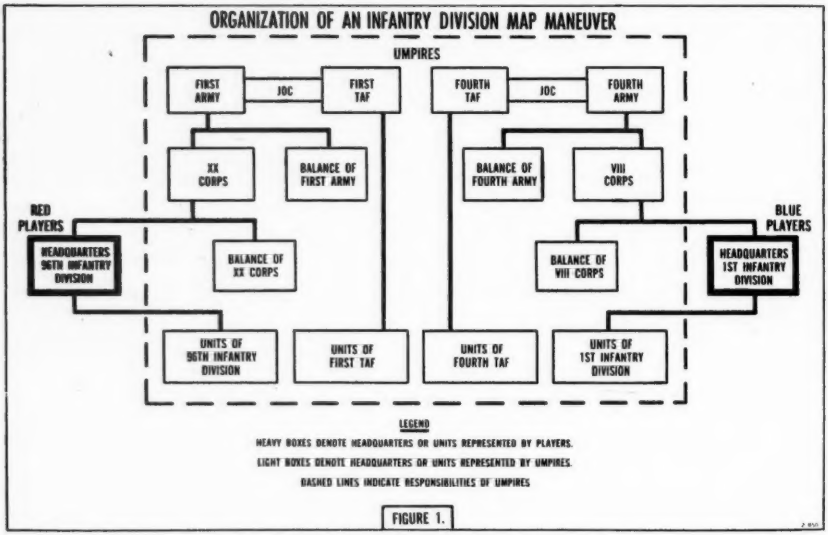


FIGURE 1.

An excellent method of aiding the umpires to carry out their duties is provided by a system of check sheets outlining, by phases, the actions required of players. These check sheets should be prepared in advance for each of the general staff sections in the umpire group. This applies to any type of maneuver. It must be remembered, however, that in a free maneuver, these check sheets are not intended to be restrictive, but are reminders of actions to be taken.

Advantages *versus* Disadvantages

The map maneuver, being broad in scope, and requiring group plans and decisions, allows for a great number of learning situations. The players assume their respective command and staff positions. The umpires then cause the situation to change continuously for one or both sides in order to make the problem progressive, and to create a sufficient change in the situation to ensure realism and the application of the intended doctrine.

The most important advantage of the map maneuver is the development of team play. The players, by virtue of their assuming various command and staff positions and their functioning in such roles, are required to make decisions relative to the staff as a whole.

The map maneuver is an excellent ve-

hicle for the application of tactical and administrative principles. It is an applicatory exercise in which theories may be tested, under proper conditions, to determine their practical value.

The map maneuver is valuable for testing proposed field maneuvers, for much time can be saved if the higher level command and staff action has been accomplished prior to the time the troops take the field. The field maneuver, then, becomes an actual test of time and space calculations, decisions, plans, and orders. Thus, the commander and his staff are free to supervise troop activities, and the troops are spared the harassment of countermarching and waiting.

Another important advantage of the map maneuver is that it provides simulated combat conditions. The map exercise usually is a stated problem, to be solved with no active opponent. The map maneuver, however, provides the players with an active enemy and constantly changing situations, which lead to more realistic conditions. The players can see what is happening and are able to make decisions based upon their observations. The map maneuver, therefore, provides as realistic an approach to combat conditions as can be had in a classroom situation. The subjects that lend themselves to application as map maneuvers are limited only by the scope of military endeavor. Strategy, tactics, and administration, at any level of command, can be used.

Like any other instructional device, the map maneuver has some disadvantages. A map maneuver is not a suitable vehicle for imparting *new* instruction because it is the type of teaching device that requires the application of principles learned previously. It is difficult, during the course of the map maneuver, to impart, to the student, any new tactical or administrative principles since he is concerned in playing his part as a commander or staff officer in an operating headquarters or installation. Another disadvantage is that all students do not take part in all of the instruction being applied. For example, the G2 will be re-

SKETCH OF TYPICAL UMPIRE CUBICLE

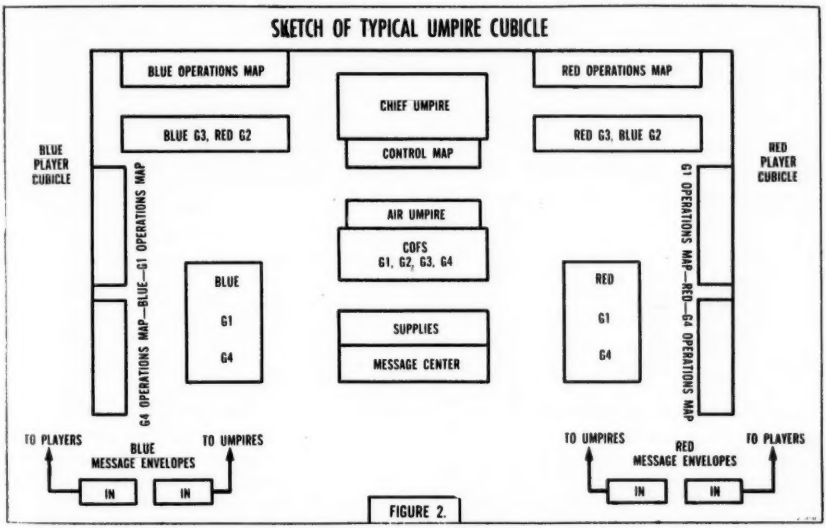


FIGURE 2.

quired to make an estimate of the enemy situation, but the G1 is concerned with his own detailed work and does not benefit from the work done by the G2. This disadvantage can be removed by rotating assignments as play progresses.

Training the staff is a continuing responsibility in all organizations. There are two ways in which assignments can be made to derive the maximum advantage from the training opportunities offered by map maneuvers. First, by specialized training where commanders and staff officers assume their respective organizational positions. Second, by rotating assignments so that they will differ for each exercise. The second method enables students to gain an insight into the workings of sections other than their own.

Another way to ensure thorough training is to have periodic conferences and briefings to keep all the players and umpires up-to-date on the operation.

Map maneuvers should be used after the study of a phase of instruction is complete. For example, infantry division map maneuvers should follow instruction in infantry division operations. Participants must have an understanding of the tactical and administrative principles which are to be applied in the maneuver. Command and staff functions and procedures should be well known to the players. These prerequisites are necessary, for the player will be responsible for the knowledge of certain subject matter in various situations, and for making decisions based upon his ability to apply his knowledge to the problem at hand.

Preparation

Now that we have considered some of the general aspects of map maneuvers, let us turn our attention to the preparation of this instructional device.

The officer designated to prepare a map maneuver initiates its preparation upon receipt of a directive. A directive is a concise, simple statement of the purpose and scope of the exercise. It forms the outline for the maneuver. The preparing officer must analyze carefully this directive and be sure he has a complete understanding of its meaning.

Situations

The next step is to evolve a situation in which to place the forces to be played in the maneuver. First, a general situation is required in the form of a brief statement as to how the opposing forces arrived at their present positions and what, in general, they are doing. The general situation applies equally to each of the opposing forces, and is amplified by detailed special situations.

The special situations must be co-ordinated. The best way to obtain this co-ordination is to place the forces being played in positions on the map where you desire them to gain contact, and then play the operation backward to the starting point. The special situations must be written so they represent a challenge to the players. The usual "fog of war" must be present. If all plans are complete, if adequate logistical support is available, if no personnel complications are involved, and if complete information of the enemy is given, a minimum of player activity will result.

The special situations must provide for continuous activity by all agencies and staff sections represented in the maneuver. To do this effectively requires considerable ingenuity. Unless careful preplanning is done, a maneuver, involving both tactics and administration, is apt to resolve itself into placing tactical considerations in the primary role, with the result that too little emphasis is placed on administrative problems.

Requirements

The requirements in the map maneuver are designed, first, for the group, and, second, for the individual. The initial group requirement should establish an orderly manner of operation. Normally, play begins with an order from the next higher

headquarters, which includes a map or an overlay showing the disposition of forces at a designated time just prior to the beginning of maneuver time. This enables the maneuver director and his assistants to anticipate the development of the situation and to check the progress of the maneuver.

Individual requirements are those necessitating action based on situations as they develop. Each player must make decisions pertaining to his assignment based on the situation which confronts him. Each decision the student makes is the result

Red player group showing the co-ordination that takes place in the G2 and G3 Sections.

of his own analysis of the problem. He learns very quickly the folly of making these decisions in a "vacuum." If the player takes action without the required co-ordination with other members of the staff, he soon will find that he has committed serious errors. Thus, the ability of each player to make the proper decisions is reflected in the composite result of the group operation.

Issue Material

The issue material for a map maneuver is divided into three categories:

1. The material presenting tactical and administrative situations to be played.
2. The administrative instructions for players and umpires.
3. A solution.

The material issued to establish tactical and administrative situations consists of

Red umpire group showing the activities that take place in the G1 and G4 Sections.

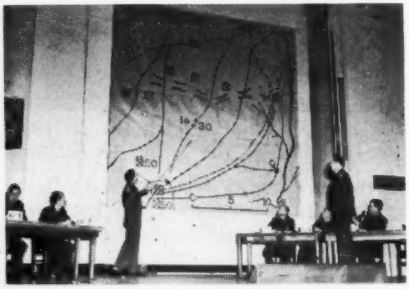
general and special situations and requirements, with supporting troop lists, estimates, and staff studies such as those on weather and terrain. This material should be held to a minimum. It must be given to the participants sufficiently in advance of the start of the maneuver so all players and umpires can read themselves thoroughly into the situation. Purely administrative instructions in connection with

Blue player group showing the message center and the maneuver time clock maintained by the message control officer.

the maneuver also must be issued. They cover such things as manning tables, location of cubicles, communications facilities, dates and hours of play, and the maps to be used.

Length of Problem

In order for a maneuver to develop properly, it must be played for a minimum of one full day. Longer playing times are desirable, if available. One method of conserving time is to use a simulated time ration designed to speed up play. To be realistic, scheduled actions by units must consider time and space factors, calculated as they would be for units in the field. Since staff action requires less time than troop movements, adoption of a ratio of 1 hour actual time to 2 or 3 hours of maneuver time may be helpful.



A large wall map is used in the skit to outline the mechanics of the maneuver. The division commander is presenting his concept of the operation to his staff.

Conduct

Now, let us turn our attention to the conduct of the map maneuver. The springboard is the orientation of all the players concerned by the maneuver director, the purposes of which are to establish an orderly method of procedure, to ensure that all participants understand the coordination involved, and, finally, to reconcile any conclusions reached as a result of prior study. A proper orientation ensures that players and umpires have the same point of departure from which to solve the problem. Upon the completion of the general orientation, the umpire group must be further briefed, since there is pertinent information for them that the players should not have.

Skit

When introducing the map maneuver to groups without previous experience in this instructional vehicle, a demonstration, in the form of a skit, is invaluable.

The primary purpose of such a demonstration is to outline clearly the mechanics of the maneuver. The situation portrayed obviously should not be the same as that in the maneuver, since, during the skit, the principal decisions usually will be made and announced.

Air Play

One of the foremost objectives of the map maneuver is to inject realistic air play into the operation. This applies with equal force to tactical air support and to aerial reconnaissance.

The principles as laid down in the *Joint Training Directive* should be followed. This directive for air-ground operations was prepared jointly by the Office, Chief, Army Field Forces, and the Tactical Air Command, and is dated 1 September 1950.

It is interesting to note that an air evaluation team, reporting on its observation of the results of air action in Korea, stated that, in many cases, air power was not employed properly. They stated further that a lack of knowledge on the part of commanders and G2s and G3s (Air) was responsible for a great part of the difficulty. The map maneuver is an excellent teaching medium to focus attention on air activities.

Note on the sketch of the umpire cubicle (Figure 2) the location of the air umpire. He should be present in each umpire group. He represents all elements of the air-ground operations system of the opposing forces which are superior to the two player groups. He is G2, Air, and G3, Air, at corps and army headquarters. He may represent the joint operations center.

He represents the entire striking forces of the tactical air force supporting the armies of which the opposing units are a part. For air support requests, the air umpire also may represent subordinate

The chief umpire co-ordinating air play with the air umpire, under the supervision of an air officer and the maneuver director.

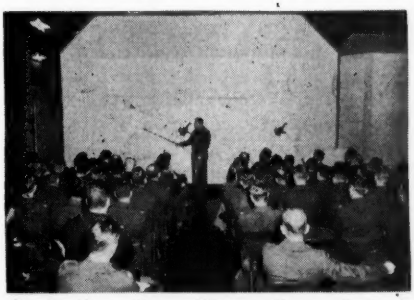
elements of the divisions, in the event the divisions are not employing air properly. He may represent ground liaison officers stationed at the fighter and reconnaissance airdromes of the tactical air force for the purpose of furnishing information. The air umpire must stimulate and actually does conduct the air play of the maneuver. If an air force officer is available, he should be used in the role of air umpire.

As an example, the following action should take place in the umpire cubicle when an air support mission is requested by one of the player groups. The table below indicates the umpires of primary interest to the air umpire.

Blue	Chief Umpire	*Red*
G1	Air Umpire	G1
G2		G2
G3		G3
G4		G4

Assume that a Red unit requests an air strike against a Blue unit. The air umpire, acting as the corps G3, Air, goes to the chief umpire for a decision as to whether the progress of the maneuver will permit the use of air, based on the disposition of opposing troops. Assume that the chief umpire has decided that the air attack will be executed. The air umpire will go to the Blue G3 umpire because this umpire has the latest information on the disposition of all elements of the Blue forces. Having determined their dispositions, the air umpire checks this information against the control map and confers with the chief umpire to determine the amount of the damage to be inflicted on the Blue forces. The air umpire next informs the requesting unit that the attack has been approved. A fragmentary report of the results of the air strike is sent to the Red unit's G3, Air. This report should include only the information which the attacking fighter pilots are able to observe. Detailed information of the results of the air strike are furnished to the Red G2, Air, only after he has made a request for the information by photo or visual reconnaissance, whichever is most appropriate.

The air umpire now ascertains that the



Conducting the critique. Note that all the players are seated comfortably and that the wall maps are of sufficient size and clarity to be seen by all the participants.

Blue umpires, who represent the subordinate Blue units which were the victims of the air strike, send the proper reports to the Blue division commander. If the air attack was executed against a regimental

combat team, the Blue G1 umpire, acting as regimental S1, reports the number of casualties as determined by the air umpire and chief umpire. The Blue G4 umpire, acting as regimental S4, reports equipment losses.

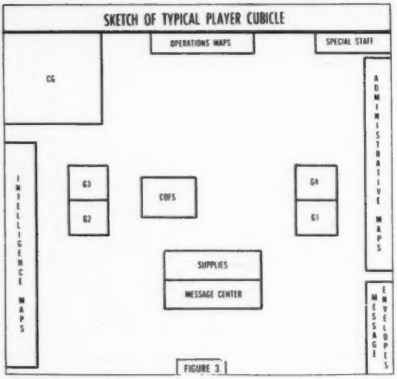


FIGURE 3

Facilities

The facilities for conducting a map maneuver need not be elaborate. All that is required are tables and chairs for the players, and space for the posting of maps.

From this minimum requirement, facilities may be expanded to the limit of availability. The photographs on page 21 illustrate typical layouts used at the Command and General Staff College for an infantry division map maneuver.

Critique

It is important to hold a critique at the end of a map maneuver. If this period is well conducted, it has much instructional value. The critique develops the purpose of the maneuver, shows how the purpose was achieved, and indicates favorable and unfavorable actions which occurred during the play. During the critique, errors made in preparing plans and decisions, in staff organization and procedures, or other items incident to the problem should be discussed, and outstanding achievements should be mentioned. The most important result of a good critique is constructive criticism. A recital of events or nonconstructive criticism of the problem or of the participants has no part in the critique.

Members of the maneuver group who will participate in the critique should be notified early that they will take part. They should be told that they will be expected to cover certain aspects of the play. In this way, they will be prepared to devote more attention to the particular phase which they are to cover.

A solution should be presented at the conclusion of a maneuver. This may be done in several ways. It may be presented orally by the group director, or it may be written and issued to the players at such a time that they will be able to read it and ask questions.

In a free maneuver, an infinite number of solutions are possible. In such cases, it must be pointed out that *a* and not *the* solution is being presented.

Conclusion

Map maneuvers, as an instructional vehicle, have a very definite and important place in the curriculum of the military student. Their use affords an excellent opportunity for training in both command and staff activities and is an effective way to build the concept of teamwork in an organization.

Let The Women Do It

Colonel John W. Davis, *Artillery*
Instructor, Army War College

The views evpressed in this article are the author's and are not necessarily those of the Department of the Army, the Army War College, or the Command and General Staff College. —The Editor.

AT THE Key West meeting of the Joint Chiefs of Staff, in 1948, the roles and functions of the three services were delineated. One of the functions assigned the Army was: *to provide Army forces for the defense of the United States against air attack in accordance with joint doctrine and procedures approved by the Joint Chiefs of Staff.* The Navy and the Air Force were assigned corresponding functions, suitable to their capabilities. In addition, the Air Force was given unilateral responsibility for the air defense of the United States.

Responsibilities

Accordingly, each of the three services contributes to the air defense of the United States. The Air Force provides interceptor aircraft and an early warning system. The Navy furnishes aircraft, as required, and sea-borne means of air defense, such as antiaircraft vessels and picket ships. The Army contributes antiaircraft artillery and surface-to-air guided missiles. Both the Army and the Navy have organic radar and aircraft warning equipment which supplements the early warning system operated by the Air Force.

Costliness

It takes very little imagination to visualize the possible immensity of the air defense effort. The United States is large in area, roughly twenty-five hundred by twelve hundred miles. Our population is preponderantly urban. We have many widely separate population centers and areas of concentrated industry. It is a task that could consume not hundreds of thousands, but millions of men, and billions of dollars of matériel. The end items employed in air defense—interceptor aircraft, radar, guided missiles, and antiaircraft artillery—are expensive, very expensive. These end items are not push-button affairs. Many intelligent, well-trained people are required to operate them.

Defensive *versus* Offensive Effort

Not only is the air defense of the United States costly, but it constitutes a purely defensive effort, a direct subtraction from offensive means. Every aircraft employed

It is the privilege of every man and woman to fight any enemy attempting to destroy this country. So that available manpower may be utilized for offensive action, the use of women in AA units in the US is favored

to protect the United States from air attack is one less available for tactical air support. Every soldier at an antiaircraft gun site in the United States is one less available for offensive action against the enemy. The decision as to the extent of the resources to be employed for this purpose is a major one, involves many complex factors, and may have far reaching effects.

The Germans, the Japanese, and the British were faced with this dilemma in the past war. The million and a half persons employed by the Germans in air defense and the industrial effort expended for aircraft, armament, and munitions were significant and important factors contributing to their ultimate defeat. Similarly, the air defense effort by Great Britain was a strain that was sorely felt throughout the war. Fortunately, this was not a problem for the United States. But remote as the threat may have been, we had able-bodied men manning antiaircraft guns in defense of Washington and other areas regarded as vital.

The shoe is now on the other foot. It is painfully clear that this immunity from air attack, which we enjoyed in the past war, will not be repeated in a future conflict. Aircraft of the *B-29* type, operating from unfriendly bases, have the capability of penetrating the air space over any area of the United States. True, to reach some areas, one-way missions may be required, but this cannot be regarded as a serious deterrent. The loss of an airplane and crew after the successful delivery of its A-bomb is readily acceptable.

The Problem

What do we do about it? Can the United States be left unprotected against air attack? The answer is *no*: a *no* that becomes more emphatic with the passage of time, and the consequent increase of opposing A-bomb stock piles. On the other hand, do we place primary emphasis on the air defense of the United States? Again the answer must be no, at least for the present or foreseeable future. This is a task that could absorb our entire military potential, and ensure nothing more than a high attrition rate of hostile aircraft.

The answer obviously lies somewhere between these two extremes: a solution which will, first, place primary emphasis on offensive means, in other words, the ships, aircraft, and divisions which will carry to a successful conclusion any war thrust upon us; and, second, provide for the protection, in this country, of those areas contributing most vital support to these offensive means. After all, the carrying of the fight to the enemy and the destruction of his capabilities at the source constitute the best and only sure defense.

The best defensive means the British and Americans could provide alleviated, but did not prevent, the German *V-1* bombardment of London. The menace was not eliminated until allied divisions had cleared the Pas de Calais, Belgium, and parts of Holland. Nevertheless, the effort expended in the *V-1* defense of London was not wasted. As a defensive effort it was very successful, eventually accounting for 70 percent of the missiles launched. Similarly, the allocation of resources to the air defense of the United States is necessary, but it must be a frugal not a lavish allocation. The unimpairment of our offensive strength must be kept in mind. Nevertheless, sizable forces will be required to defend this country from air attack.

The Army's Role

The part that the Army will be required to play in the air defense of the United States should not be underes-

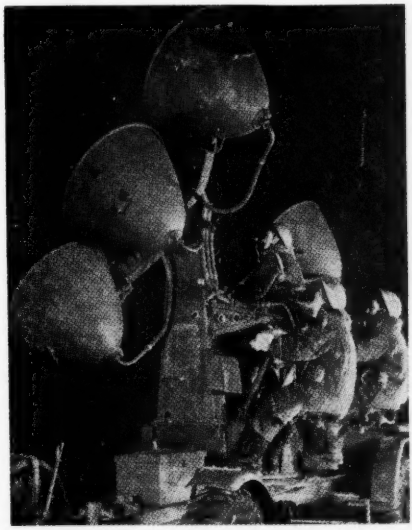
timated. The Army may and probably will be the greatest contributor of the three services in personnel and matériel. With the development of surface-to-air guided missiles, Army weapons may well be the backbone of air defense. Fighter aircraft may even be relegated to a secondary role, that of constituting a mobile attack force to reinforce or to plug gaps in static air defenses. Since these statements may be regarded with some skepticism, a few examples of the last war are cited in illustration.

Illustrations

In 1943, German flak accounted for one-third of the Eighth Air Force losses over Germany. In 1944 and 1945, flak accounted for two-thirds of the bombers shot down—and considerable numbers *were* shot down. True, that in 1944, the *Luftwaffe* was beginning to lose its punch. But, at the same time, German flak had neither the proximity fuze nor radar of the quality equivalent to our SCR 584, both of which were then available to us. It has been said that these technical advances or improvements multiplied the lethality of our antiaircraft artillery guns by three.

On our side, between D-day and the cessation of hostilities, the antiaircraft artillery of the 12th Army Group made 2,100 confirmed kills, inflicting an attrition rate of approximately 11 percent. Despite our overwhelming air superiority, fighter kills never approached this total. On 1 January 1945, the Germans made one of their biggest air efforts, an estimated 700 to 750 sorties, directed at our airfields. Antiaircraft artillery destroyed 220 of the attackers; fighter aircraft less than 100.

We again turn to World War II for some indication of the drain on manpower imposed by the use of antiaircraft weapons. Germany, at a time when a maximum of a million and a half persons were employed in air defense, had 850,000 persons manning antiaircraft weapons. In Great Britain, the greatest number similarly employed was slightly more than 300,000, but this figure does not include the Royal Air Force personnel who



A searchlight battery operated entirely by women during the Battle of Britain.

operated barrage balloons and automatic weapons in defense of airfields.

Technological advances during the postwar period, to some extent, alter this World War II picture. Radar has eliminated the antiaircraft searchlight. Barrage balloons are obsolete. In so far as the United States is concerned, the A-bomb has all but eliminated requirements for antiaircraft automatic weapons. The attainment of an air burst of maximum blast effectiveness necessitates the release of the A-bomb, by the carrier aircraft, at an altitude far above the effective range of automatic weapons. Of course, there are certain targets which are attacked most successfully from a low altitude.

These are comparatively few. The antiaircraft gun itself may be on the verge of obsolescence, but as long as we have *B-29*-type aircraft to shoot at, it is a very effective weapon. Surface-to-air guided missiles, as they become available, may, in time, supplant the antiaircraft gun.

Therefore, we may expect that the antiaircraft defenses of the United States will consist of a small percentage of automatic weapons, a preponderantly large percentage of antiaircraft guns, and a small but growing percentage of guided missiles. Even with the deletion of searchlights and barrage balloons, and small demand for automatic weapons, personnel requirements will be large.

Great Britain and Germany entered World War II with antiaircraft defenses manned with young, able-bodied men; personnel physically qualified for active service on the battlefronts. Both had to change.

The British Experiment

The British, faced early in the war with manpower problems, began, in 1940, to experiment with women in mixed batteries; that is, units composed of both men and women. It might be added that the experiment was conducted to the accompaniment of many misgivings in official circles. Some politicians were fearful that public opinion would never sanction women operating death-dealing weapons of war. Others felt that women would be coarsened and their morals lowered by military service. Despite these misgivings, the experiment was considered a success. Women were permitted to volunteer for service in antiaircraft artillery units, were trained, and then organized into "mixed" batteries. At one time, 74,000, equivalent to four divisions, were enrolled. It was estimated that 170,000 could have been employed had they been available.

As events proved, public opinion did not recoil in horror. On the contrary, the British public appeared to take tremendous pride in the fact that their women were defending the homeland. Morals, in mixed batteries, were no lower than in civilian life. But quite surprising to many, women actually proved better in their assigned tasks than did the average male soldier. Their coolness and courage were amply demonstrated in hundreds of antiaircraft engagements during the remaining years of the war.

As the war progressed, more and more of the young, able-bodied men were diverted from antiaircraft units deployed in defense of Britain to overseas combat units. Their places were taken by older and physically limited men. Eventually, the Home Guards were employed on a part-time basis, an expedient which was not too successful. By the end of the war, older and physically limited men, the Home Guards, and women were doing the job.

German Experience

The German experience, in many respects, parallels that of the British. Until the end of 1942, German antiaircraft units, deployed in defense of the homeland, were composed of men physically qualified for service on the active fronts. Beginning in 1943, the manpower pinch began to be felt severely, and antiaircraft units defending the homeland were among the first to be tapped. To meet these manpower demands, an antiaircraft auxiliary was organized, composed of a hodgepodge of factory workers, foreign nationals, prisoners of war, and women. This auxiliary eventually comprised 44 percent of the personnel in antiaircraft units. The remaining 56 percent were regular military personnel, but the majority were in the older and physically limited categories. Women were em-

ployed in limited numbers, but were poorly trained and did not do well. The German expedient, as a whole, could not be considered a success.

It would be well for us to look rather closely at the British and German experiences. Both found, early in the last war, that manpower demands would not permit able-bodied men to be utilized in the antiaircraft defense of their homelands. Both resorted to the employment of women and over-age and physically limited men. The Germans, in addition, used prisoners of war, factory workers, and foreign nationals.

Need for Air Defense

But there is an essential difference between the early '40s and the present time. The rate of destruction, then, of a nation's industries and population by conventional explosives was far less than that now capable of being inflicted with mass-destruction weapons. Despite punishing air blows, Britain and Germany had some time to adjust their defenses. Time was costly then, but it is infinitely more valuable now. The first month, even the first days of a conflict, could see very severe, if not crippling, casualties and damage inflicted on this country.

This time factor is so clearly unmistakably vital, that it is stating the obvious to say that an air defense system is an urgent necessity. It is apparent, too, that the Army, the Navy, and the Air Force components of our air defense system should be at effective strength, well trained and efficient, and must be so maintained as long as there is any threat of an air attack with mass-destruction weapons.

Sources

Initially, the Army's obligation to provide forces for the air defense of the United States may be met, wholly or partially, by the allocation of existing antiaircraft units of the Regular Army, National Guard, and Organized Reserve earmarked for overseas service. Although this expedient is certainly necessary at the present time, it is dangerous to rely too heavily upon it. An equally urgent requirement will exist for these units to provide antiaircraft protection for overseas field forces, their bases and ports, and for overseas airfields and air bases. The need for antiaircraft artillery is certain to be acute during the early stages of the battle for air superiority. A margin of safety requires that at least a nucleus of antiaircraft units be earmarked for the air defense of the United States. This would alleviate the problem of conflicting demands between the United States and overseas commands, in the early stages of a conflict.

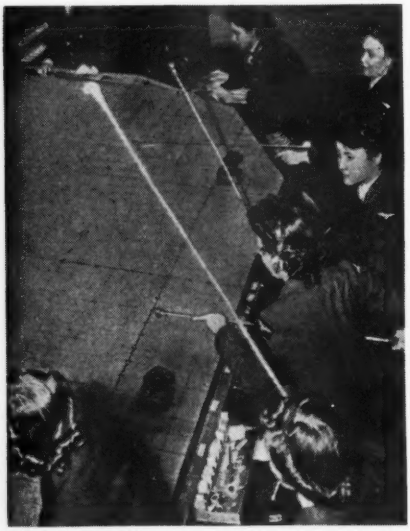
ATS girls using a spotter on a gun site, searching the skies for hostile aircraft.

Further, antiaireraft units to be employed permanently in the air defense of the United States should be comprised of personnel physically not suitable for service in the combat zone. Certainly they should not contain able-bodied men likely to be withdrawn as the urgent need for such manpower arises. We can and should avoid the loss of efficiency

and waste motion which would result. The alternatives are limited—workers in industry and over-age and physically limited men and women.

Use of Workers

The employment of workers in antiaircraft defense is suggested frequently. The premise is that a preponderant amount of the antiaircraft artillery will be sited in or near industrial and heavily populated areas; that workers can be formed into home guard antiaircraft units to function on an alert or part-time basis. The idea is attractive and, if practical, would result in appreciable savings of manpower. Unfortunately, there are many serious drawbacks to this scheme. In the first place, most antiaircraft units will be located outside the area defended in order to intercept attacking aircraft before bombs can be dropped. Those distances, outside the defended area, may not be great, but they may be sufficient to create a transportation problem. But much more serious is the training problem. Antiaircraft actions are short and intense. Perfect timing, co-ordination, and teamwork are required. Months are required to train personnel to operate and maintain radar, fire control equipment, and armament. Control and discipline are essential. This system of worker utilization provides none of these elements. Now add the problems engendered by constantly shifting personnel, sickness, absence, and boredom, and we have an impossible situation. The value and capabilities of the equipment are too great to be wasted in such arrangements.



Women plotting the course of friendly aircraft for Royal Air Force controllers.

Over-age and Physically Limited Personnel

There is no reason why efficient and effective Army antiaircraft units cannot be organized and trained, utilizing over-age and physically limited personnel. Any position in a headquarters or firing battery can be filled by personnel within these categories, providing they are not infirm or hopelessly incapacitated. However, there will be strong competition for the over-age and physically limited males. They may be gainfully employed elsewhere in the services, particularly in rear areas and in Zone of Interior installations. In addition, industry must draw heavily on these categories for workers to turn out the machines of war.

A Suggested Solution

Women can perform 50 to 60 percent of the tasks in a static gun battery, and, as a matter of fact, perform them as well if not better than men. Such tasks include the operation of fire control and radar equipment, plotting tables, telephones, and switchboards. They can act as cooks, clerks, and drivers. Women, likewise, can perform an even higher per-

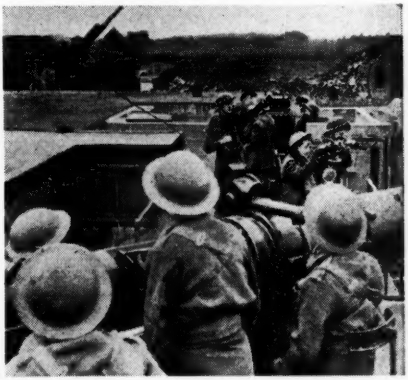
centage of the tasks in the various headquarters organization, and do them efficiently and well. The actual manning and operation of the guns is beyond the physical capabilities of the average woman. Again, there is not unlimited womanpower. Women are not only employed profitably elsewhere in the three services, but industry will depend upon the employment of a large percentage of women.

The most serious obstacle to the employment of women in antiaircraft units appears to be fear of public opinion. The suggestion frequently will bring forth the remark that "the public won't stand for it." The basis for this fear is difficult to find. Certainly, some people would oppose the idea of women serving in combat organizations. Unanimity of opinion is not obtained in this country on any issue. Contrary to this frequently expressed opinion, it is believed the great majority of the public would not only stand for it, but like it. After all, this country has a heritage of fighting women. For example, Molly Pitcher, at the Battle of Monmouth, took the place of her husband on an artillery piece after he had been overcome by heat; our pioneer women, who helped build the nation, endured the hardships of frontier life, and, on more than one occasion, fought the Indians, side by side with their men. For the benefit of those who have qualms on this issue, it should be borne in mind that the destruction of aircraft by gun fire is a very impersonal business. The women, operating fire control and radar equipment, contributing to the kill, do no more than those women working in factories producing the munitions and machines of war. In any case, it should be the privilege of every citizen, man or woman, to fight and destroy any enemy attempting to inflict destruction on this country.

Conclusion

The employment of women and over-age and physically limited men in Army antiaircraft units, allocated to the air defense of the United States, is favored. The argument may be advanced that the employment of women is not necessary and that they can be more profitably employed elsewhere in the services or in essential industry. This is doubted. There is ample precedent, found during the last war, when the British, and to a lesser extent the Germans, found it necessary to utilize women in their antiaircraft units. Women are as well if not better adapted to perform a proportion of the tasks in a firing battery than are men.

The time factor in this period of tension is vital. Advance warning of an attack may be short, indeed. We must be prepared to counter air attacks with effective means, and to maintain our defenses in a high state of efficiency as long as the threat of an attack with mass-destruction weapons exists. We cannot afford to experiment after the air onslaught is launched. It is believed that practical measures can and should be



Army Territorial Service girls using a range finder during the Battle of Britain.

taken now to prepare ourselves better to meet the shock of air attacks. Some of these measures are:

1. Establish, now, mixed antiaircraft artillery units for allocation to the static air defense of the United States. Determine the percentage of women that may be employed profitably; the proportion of over-age males that may be used; and the types of physical disabilities which do not handicap the performance of such duty.

2. Encourage officers and men, incapacitated by wounds or illness to the extent that they are no longer physically qualified for active combat, to transfer to static antiaircraft units. Train such personnel as battery officers, communications and radar officers, and as radar, fire control, and gun maintenance personnel.

3. Establish Reserve Officers' Training Corps antiaircraft artillery units for women in our colleges.

4. Authorize women to take appropriate courses in antiaircraft artillery and guided missiles at the Antiaircraft Artillery and Guided Missile Center at Fort Bliss, Texas.

We are engaged in a historic effort to hold together all of the free peoples of the world in the face of the greatest danger ever confronting them.

As a leader in that effort, we must demonstrate to the whole world that the Founding Fathers were wise in their faith that our Government of divided powers would never suffer disunity or frustrate necessary action in time of peril.

President Harry S. Truman

National policy on military matters can rise no higher than its source, and that source is the American people. Military power and the will to use it in the national interest spring from the people at large.

Lieutenant General M. S. Eddy

New 'Flying Vehicle' Transport In Our Army

Lieutenant Colonel Charles W. Matheny, Jr., *Artillery*
Student Detachment, Liaison Pilot Course, San Marcos Air Force Base, Texas

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or the Command and General Staff College.—The Editor.

HAVE you ever seen a flying truck, a jeep with wings, or an ambulance that glides through the sky? It sounds fantastic—but this is almost the realization of your modern Army. We are now emerging from what might be called the motor transport age, and the Army forces are advancing to the use of the newest types of air transport.

The use of aircraft by the Army, such as helicopters, small fixed-wing aircraft, and convertiplanes of the future, which can operate without prepared landing strips in the forward areas of the battlefield, opens new concepts of ground operations which can affect important changes in the nature of land warfare. The more extensive use of aircraft transport by front-line fighting units does not alter the role of the combat soldier, but further stresses the fact that the character and equipment of the front-line fighting soldier, that we have known in the past, gradually is being changed in modern warfare. These changes are coming about through the adaption, for use in Army units, of modern transport, weapons, and communications which have been made available by recent technological advances. A modern army must continue to have well-trained, physically hardened, intelligent, high caliber, technically qualified combat soldiers, but the techniques, equipment, and the methods of ground combat will be revised and reoriented toward utilizing the advanced technical ability of the average citizen of today.

Modern Transport

A primary factor concerned with the modernization of Army tactics is the use of modern transport. Air transport, both in the form of long-distance cargo planes of the Air Force, and in the form of short-haul helicopters of the Army, will revolutionize current thinking as to the logistical support and tactical mobility of land forces.

The Army is extremely interested in helicopters. The characteristics of this new type of vehicle, which include speed (3 to 4 times that of ground vehicles), the ability to operate without roads or airfields, and the ability to move military

The use of aircraft by the Army, which can operate without prepared landing strips in forward areas, opens new concepts of ground operations which can affect important changes in the nature of land warfare

loads over water and terrain obstacles, make it apparent that helicopters will complement and replace, to a considerable extent, the present vehicular transport of front-line Army units.

Recent technical advances in helicopter design and operation are attracting increasing attention to their utilization in divisions and smaller tactical units, to add speed and flexibility to Army tactical operations and to battlefield logistical support in the forward areas. By utilizing the most modern and improved types of transport adaptable to use in Army combat units, the mobility, combat effectiveness, and resulting efficiency of these units can be improved. Helicopters will be used as short-haul transport in corps, divisions, and smaller tactical units to provide greater mobility to ground combat operations by the air movement of men, matériel, and equipment in the combat areas.

As recently as the early 1930s, the Army converted its transport from horses to motor vehicles. The continued modernization and improvement of organic Army transport in combat operations is logical—from the motor vehicle to the helicopter—and the use of this faster means of transportation in Army units does not change or affect the roles or missions of these units.

The Army is beginning to make greater use of helicopter transport, and a conversion from vehicles to this new type of air transport is taking place in certain specialized units, and for certain missions. This does not create a necessity for an Army Air Force, since aircraft can be integrated into our present units to fulfill Army requirements most advantageously and economically.

The use of this new type of air transport, of particular interest to the Army, which has been made available by natural evolution and advances in modern transportation and recently developed to the point of practical employment in Army units, does not infringe on the roles and missions of the Navy (including the Marines) or the Air Force. Helicopters are visualized as "flying jeeps" and "flying 2½-ton trucks" because they will perform similar transport tasks without the use of roads or airfields.

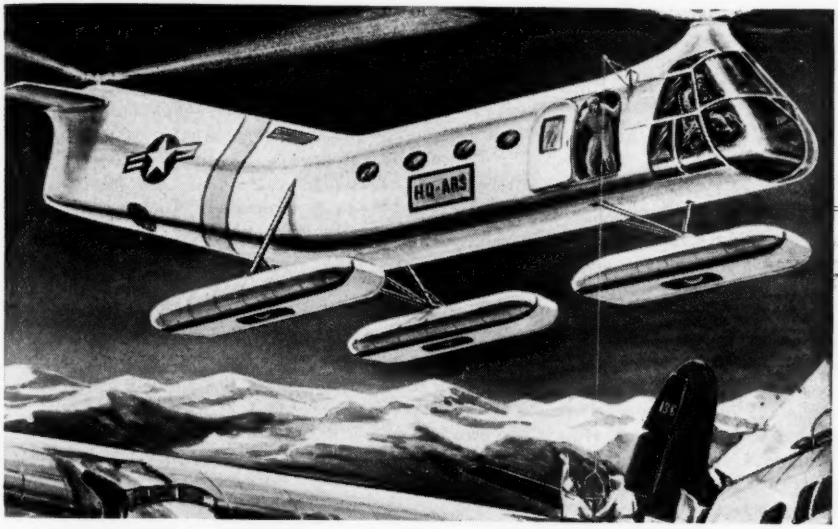
The use of these "flying trucks" in the Army is something new, and everyone realizes that there are many aspects of their use and further development which must be improved. Present limitations on the effective employment of helicopters are of the same nature, mainly technical, as those which have been encountered during the development of other means of transportation. It is accepted that present shortcomings such as load limitations and mechanical reliability will be overcome, as in the past, in the gradual process of further development.

The Helicopter Transport Company

The Army now is organizing helicopter transport companies for allocation to divisions primarily for the purpose of providing a rapid means of transportation for infantry units. These helicopter transport companies will operate in the divisions in the same way as the present truck transportation companies. They will perform a variety of tasks including the transport of supplies, food, and ammunition. Each company has 21 transport helicopters and 2 small helicopters for command and reconnaissance purposes. A unit is capable of transporting, in one lift, the personnel and equipment for the combat elements of an infantry rifle company. In addition to using helicopters in transportation companies, they also may become a part of the equipment of battalions and companies of combat and combat support units that can use them advantageously.

Contemplated Use

Small helicopters have been used in the combat arms of the Army since 1947. Helicopters now are being used for tasks



Above, an artist's conception of the *H-21* being developed for the Army and the Air Force. This helicopter features an "omniphibious" landing gear which enables it to land on snow, ice, water, or land without changing the gear. Below, the *H-19*, accommodating 8 litters or 10 passengers, can be used for all types of combat operations.

similar to those performed by the jeep. These tasks consist of transporting personnel, wire laying, reconnaissance, fire control, flank security, the movement of security patrols from one location to another, the evacuation of wounded from front-line positions, and even for flying hot food to men stationed in advance outposts.

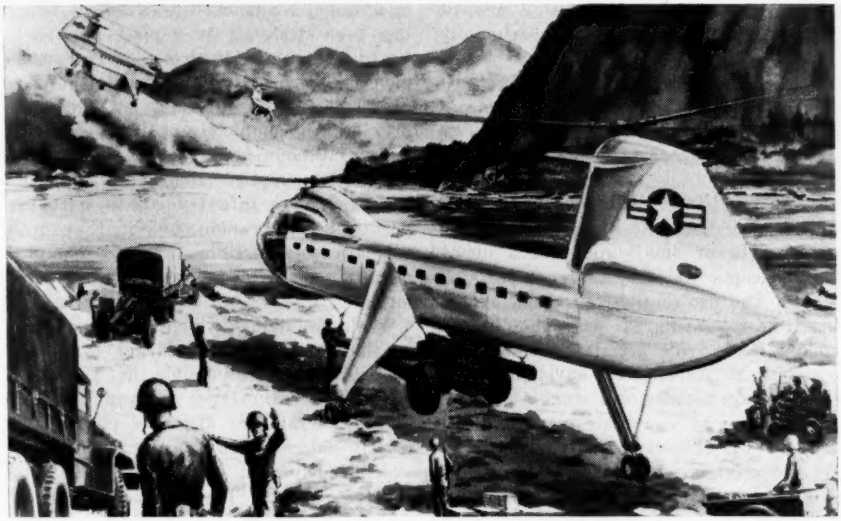
The Army will use light cargo helicopters to transport personnel, supplies, equipment, and ammunition; to evacuate the wounded; for the rapid movement of reserves from rear areas to the front lines; to move tactical units from one position to another to counter enemy attacks or to initiate offensive operations; to conduct vertical envelopments either separately or in combination with flank envelopments; and to facilitate mountain, arctic, and jungle operations where the use of ground vehicles is restricted.

In arctic regions, the difficulties and limitations imposed on military operations primarily by transport may be eliminated, to a considerable extent, by the use of helicopters. They can be used for night as well as daylight operations, since they do not require lighted landing areas. Transport helicopters will allow for a wider dispersion of troops on the battlefield, yet permit their rapid concentration at a decisive point.

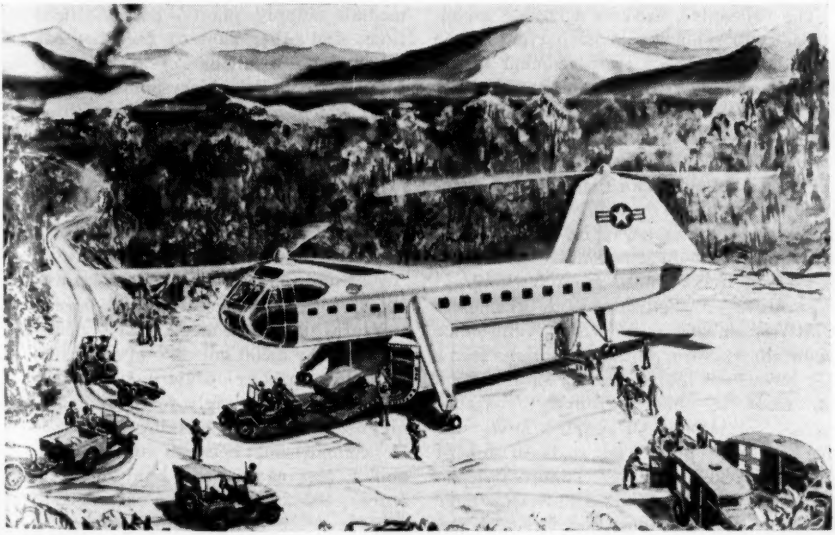
When the lift capacities of helicopters have been increased, it is quite possible that all types of supplies and ammunition can be so transported to speed the advance of a modern army. Heavy lift helicopters may be used to transport artillery pieces to gun positions in otherwise inaccessible terrain. In river crossing operations, helicopters can be used by the engineers to facilitate bridge construction and the movement of heavy equipment to the far shore prior to completion of a bridge. Eventually, the proper use of helicopters may so increase the mobility of Army units as to render those units, in the forward areas, virtually independent of conventional lines of communications.

In this new field of transport, the Army has requirements for rotary wing type aircraft from those capable of carrying one person to one capable of transporting 50,000 pounds for limited ranges. Small, single-place, two-place, and four-place (¼- to ½-ton capacity) command and reconnaissance helicopters can provide transportation for purposes of control, observation, and the emergency evacuation of casualties; in short, perform tasks similar to those now accomplished by the jeep. Next in size are utility helicopters (¾- to 1-ton capacity) which will carry from 6 to 10 persons or 3 to 5 litter patients and provide a faster means of transportation for the odd jobs now performed by the weapons carrier and ambulance. A light, cargo transport helicopter—a "flying 2½-ton truck"—is necessary to carry loads approximating 2 tons or 15 persons. Larger transport helicopters are required to provide the necessary heavier transport for battlefield logistical support and tactical operations in the forward combat areas. Heavy lift helicopters will meet the requirements for a "flying crane," capable of moving heavy equipment over terrain obstacles.

Prior to the 1930s, ground maneuvers were measured by the average distance that infantry or cavalry units could march in a day. After the conversion of the Army's combat transport from horses to vehicles, land operations were based on the average distances that combat units equipped with truck transportation could travel in 1 day. With the advent of the use of transport helicopters by ground forces, future maneuvers and operations will be based on the capabilities and characteristics of these new "flying vehicles," and the distance that units equipped with them can fly in 1 day. Thus, through improvements in organic transport, the Army, in the near future, can increase greatly the mobility of tactical units from the



One of the best answers to the military's ever increasing demand for larger helicopters is offered by the *XH-16,* which is expected to be completed and tested late this year. Above, an artist's conception of the *XH-16* being used to transport a 155-mm howitzer. Below, the *XH-16* being used to bring in men and matériel and to return wounded personnel.



presently established basis. Our present motorized units can march approximately 150 miles a day at an average speed of 15 miles an hour. By converting unit transport to helicopters, it would appear reasonable for a unit to march 600 miles a day at an average speed of 60 miles an hour.

New Operational Concepts

The use of helicopters for air transport in the field of small-unit tactics opens new concepts of operations in ground combat. The use of these aircraft, operating from forward areas without prepared landing fields, will permit a commander to employ his forces in the envelopment of a key terrain feature or a stubborn center of resistance by rapid air movement instead of by difficult ground movements. The potentials resulting from the use of helicopter transport in connection with pursuit operations, in stopping enemy break-throughs, and in normal maneuvers on the battlefield can be visualized easily. In the past, the ground forces have used Army aircraft primarily for reconnaissance and field artillery fire control.

The helicopter, used as a "flying ambulance," will replace a large portion of the ambulances in the forward combat areas, since it can pick up the wounded in the front lines and transport them directly to base hospitals in a fraction of the time now required by vehicular transport. The "flying ambulance" can facilitate the evacuation of wounded in cold weather operations where, at temperatures of 40° below zero, immediate evacuation is imperative to prevent the wounded from freezing.

The use of helicopters to transport relatively large units will revolutionize mountain warfare. Alpine operations formerly have been limited by the slow tedious movement of small groups of highly trained specialists. All supplies have been "backpacked," pulled on sleds or toboggans, or packed on mules. The great technical superiority that the American soldier normally possesses does not exist in the mountains. No tracked or wheeled vehicle has been designed to replace the packboard or mule. Air drops of equipment have not been entirely satisfactory. When drops miss the target by several feet, they may be lost completely or it may require a several hour cross-country trip to retrieve the supplies. Helicopter transport will enable an infantryman to seize important heights rapidly, heights that formerly were accessible only to qualified mountaineers after hours of difficult climbing.

With the strides which are being made in the development of larger type helicopters, it is quite possible that the movement of certain types of supplies over normal terrain for distances of approximately 100 miles can be accomplished more expeditiously and economically than by present methods. The logistic support of rapidly advancing troops was a major problem of World War II which may be overcome by the use of transport helicopters. In addition to providing a faster and more flexible means of transportation, it is to be expected that numerous intermediate supply points, medical installations, and other support facilities can be eliminated, resulting in a considerable savings in logistical personnel and equipment which, in turn, would contribute to a reduction in supporting troops. The consequent reduction of traffic on the highways in the combat area should reduce congestion and maintenance problems.

Transport Capabilities

A rough calculation of the transport capabilities of helicopters *versus* vehicles indicates that 105 helicopters (payload, approximately 3,500 pounds—cruising speed, 100 miles an hour) could move some 2,500 tons (5 days of supply for a division) an airline distance of 60 miles in 24 hours. In comparison, between the same two points (estimated road haul distance 80 miles), 105 2½-ton trucks can move some 1,000 tons (2 days of supply for a divi-

sion) in the same 24-hour period. Improved transport helicopters are expected to have payloads of 4,500 pounds and, with this greater payload, they could move approximately 3,500 tons (7 days of supply) as compared with 1,000 tons for the vehicular transport. As a rule of thumb, we might say that it takes about three trucks to move as much as one helicopter, with similar capacity, when performing

PRESENT VEHICULAR TRANSPORT

Type	*Number*	*Capacity* (In tons)
¼-ton truck	27	6.8
¾-ton truck	5	3.8
2½-ton truck	7	17.5
Totals	39	28.1

PROPOSED HELICOPTER AIR TRANSPORT

Type	*Number*	*Capacity* (In tons)
Multiplace command and reconnaissance (0.4-ton capacity—now flying)	27	10.8
Utility type (¾-ton capacity—now flying)	5	3.8
Light cargo transport (2-ton capacity—available in late 1951)	7	14.0
Totals	39	28.6

FIGURE 1.

tasks of a short-haul transport nature in areas where adequate roads are available and the ultimate destination is accessible to trucks.

In due time, the vehicles of some combat units may give way to rotary wing aircraft. Even in the current state of development, the load capacities of helicopters compare favorably with present general purpose vehicles. For example, a comparison of the capacity of vehicular transport *versus* helicopter transport for an infantry battalion is indicated in Figure 1.

Research Progress

There are two general categories of helicopters now flying: command and reconnaissance helicopters capable of transporting a cargo up to approximately ½ ton, and utility helicopters capable of transporting a cargo of approximately ¾ to 1 ton. The Piasecki Helicopter Corporation has developed, for the Army and the Air Force, a light transport helicopter—the *H-21*—which is capable of moving approximately 2 tons or from 15 to 22 men. This craft is expected to be in production about a year from now. The Army and the Air Force also have under joint development the *XH-16* (heavy transport) helicopter (Piasecki) which is being designed to transport 3 tons or 25 troops. The *XH-16* will be equipped with a large detachable pod or compartment which is a new development in air transport. There also is under development a turbine-powered helicopter by Hughes Industries which is designed to lift approximately 9,000 pounds. Hiller, McDonnell, and American, all helicopter manufacturers, each have small jet-powered helicopters flying (jet motors are attached to the ends of the rotor blades)

which have considerable promise for the future.

The Army has initiated a project to develop a small, lightweight, single-place helicopter, suitable for military operation, which will use jet propulsion. Jet propulsion has been adapted to pilot models of one- and two-place helicopters. This offers the advantages of greatly simplified design, construction, maintenance, operation, and reduced initial cost. Jet propulsion has the current disadvantage of relatively high fuel consumption. However, future developments may reduce this. Range limitations, imposed by high fuel consumption, are not a serious disadvantage in the Army's concept of mobility, which is concerned largely with movements for short distances. While the fuel consumption is great, the cost is low, since a jet will use almost any type of petroleum product, from crude oil to gasoline.

The Air Force, which conducts the research and development for the Army's aircraft, is in charge of the development of this light, single-place helicopter, as well as a project to develop a two-place Army "convertiplane." The "convertiplane" is an aircraft that can rise or descend vertically like a helicopter and yet have considerable forward speed. Such a craft would combine the characteristics of the airplane and the helicopter, enabling it to operate at speeds approaching those of an airplane without the necessity for runways.

Helicopter Data

Information on the various types of helicopters now in production or under development by the principal manufacturers in the helicopter industry is shown in Figure 2. In addition to those shown on page 41, the Kaman, American, and McDonnell Aircraft Corporations have small helicopters in various stages of development.

As with other new types of transport or equipment which has been developed in the past, a considerable reduction in cost can be expected after industry has established mass production techniques and is producing in quantities. The helicopter is a rather complicated piece of equipment, but small craft eventually should be as simple to manufacture as the present-day automobile. Helicopters do not require the large quantities of rubber for tires that are essential to ground vehicular operations. On the other hand, they will require larger quantities of aluminum.

Logistic Capabilities

The supply of isolated ground units and beach assault and supply are primary helicopter operations. Their ability to fly undetected over tree tops at speeds of 80 to 130 miles an hour, to land in small clearings and unload complete units ready to fight, and to land supplies exactly where they are wanted without the use of prepared landing fields are exclusively helicopter operations. These missions are not hindered by weather to the degree that conventional aircraft are affected, and reduced mobility under bad weather conditions approach more nearly the restrictions imposed on ground vehicles.

Helicopters have been found by experience to be extremely useful in Korea where the road and rail systems are inadequate and the terrain is mountainous. Particularly is this new type of transport applicable in areas where ground movement is difficult or restricted, such as the Far East and most parts of Central Eurasia. The great mobility possessed by combat forces having organic air transport, which does not require landing fields, is one means of utilizing the advanced technical ability possessed by the United States to overcome some of the advantages, such as manpower, possessed by nations in the Soviet orbit.

If helicopter transport had been avail-

able in Korea, division and corps commanders might have used it to extricate surrounded units from the Changjin Reservoir area, thereby reducing the casualties and equipment losses of those units which were forced to battle their way through enemy territory to the Hungnam beachhead. Conventional aircraft were utilized for the evacuation of wounded in this emergency, but their use was restricted to operations from hurriedly constructed airfields.

HELICOPTER DATA

TYPE	*APPROXIMATE CAPACITY*	*SPEED*	*PRODUCTION STATUS*	*PROPOSED USE*
		PIASECKI HELICOPTER CORPORATION		
HUP-1	¾-ton (6–8 persons)	105 mph, cruise 130 mph, maximum	Now in production	¾-ton "flying weapons carrier"
H-21	2-ton (15–22 persons)	105 mph, cruise 130 mph, maximum	Will be flying late in 1951	2-ton "flying truck"
XH-16	3-ton (25 persons)	. . . . .	Now being developed	3-ton "flying truck"
		UNITED AIRCRAFT CORPORATION (SIKORSKY DIVISION)		
H-18	0.4-ton (4 persons)	105 mph, cruise 130 mph, maximum	Now in production	"Flying jeep"
H-19	1-ton (8–10 persons)	90 mph, cruise 110 mph, maximum	Now in production	1-ton "flying weapons carrier"
		BELL AIRCRAFT CORPORATION		
H-13	¼-ton (2–3 persons)	75 mph, cruise 90 mph, maximum	Now in production	"Flying jeep'
YH-12	¾-ton (8 persons)	85 mph, cruise 105 mph, maximum	Completed all tests and is ready for production	¾-ton "flying weapons carrier"
		HILLER HELICOPTER CORPORATION		
H-23	¼-ton (2–3 persons)	75 mph, cruise 90 mph, maximum	Now in production	"Flying jeep"

FIGURE 2.

Susceptibility To Attack

Contrary to common belief, helicopters are less vulnerable and less susceptible to attack from the air than are vehicular transport. Truck convoys usually operate on highways which can be identified easily from the air, and the only evasive tactics against air attack are to move to the side of the road, or, if the highway permits, to pull off the road. Helicopters are more difficult to locate from the air than are trucks because their movement is not confined to any particular route and they can be widely dispersed. The evasive tactics of a helicopter, when attacked from the air, can be much more effective than the restricted movements of a vehicle on a highway. Helicopters are extremely maneuverable in that they can change altitude quickly and completely reverse the direction of flight momentarily. In relation to speed, vehicular transport usually operates on roads at a speed of approximately 25 miles an hour. On the other hand, helicopters normally operate at a speed of 75 to 130 miles an hour. In comparing the vulnerability from ground attack of a helicopter with that of vehicular transport, it has always been more difficult to hit an aircraft in flight than a vehicle on the ground. Recent combat experience in Korea has indicated that, contrary to popular belief, bullet holes in the

rotor will not effect seriously the flight of a helicopter.

The Future

Looking to the future, it is not unreasonable to expect that a considerable portion of the vehicular transport now utilized by certain front-line Army combat

The twin-jet "Hiller-Hornet" can be used for observation and other light tasks.

units, such as the infantry regiment, will be converted to air transport capable of operating without landing fields. Certain divisions may even be partially or completely equipped with organic helicopter type air transport. During World War II, amphibious vehicles, which could operate on land and water, were developed, and it is probable that an "airphibian" helicopter, which can operate both in the air and on the ground, will be developed in the near future for use by Army forces. "Airphibian" craft of the fixed wing type already have been developed for commercial use and certified by the Civil Aeronautics Authority; similar principles might well be adapted to the helicopter.

Combining the characteristics of an aircraft and a vehicle into one mechanism would eliminate the necessity for the use and availability of both types of vehicles for certain special purposes. "Airphibians," suitable for operation in military units, would be most useful in situations which now require travel in both an aircraft and a vehicle. Thus, in the near future, Army ground combat units may utilize, to the utmost, the tactical advantages to be gained through the use of short-haul aircraft transport adaptable to operation in Army units.

Savings

Helicopters and light aircraft used for transport will save time, effort, and increase our combat effectiveness in numerous ways. Some of the ways in which savings might be accomplished are:

1. The helicopter, used as a flying ambulance, probably will replace two or three vehicular ambulances for each helicopter placed in operation. The helicopter ambulance can pick up wounded personnel in the front lines and take them quickly to a base hospital for specialized care, thereby reducing fatalities among the

The *H-18*, a four-place helicopter, is well suited for transporting personnel or cargo.

wounded, reducing intermediate medical installations, and reducing the requirements for highly specialized medical personnel.

2. Numerous intermediate supply points may be eliminated, resulting in a savings

in logistical personnel and equipment. Reduction of traffic on the highways in combat areas should reduce congestion and maintenance problems. The establishment of mobile floating Army supply depots, on old Liberty ships or similar vessels which could be moved easily along coastal areas or up navigable rivers from which helicopters could pick up supplies or spare parts and fly them directly to front-line fighting units, may add to the efficiency of the supply and maintenance system. Depots and maintenance repair installations of this type would be well suited to operations in Korea, Western Europe, or the Mediterranean area.

3. The use of transport helicopters would reduce substantially Army requirements for assault boats for river crossings and amphibious equipment required in landing operations.

4. Considerable savings already have been realized in an Army mapping operation in Alaska during the summer of 1950. It is reported that, utilizing helicopters to complement vehicular transport, the Army engineers were able to complete in 1 summer (2½ months) what would ordinarily require 6 summers (equivalent to 6 years, since this work only can be done during the warm months). On the basis of this experience, the Corps of Engineers has requested a substantial number of helicopters to expedite future surveying operations.

The *H-13B* "flying jeep," used by the Army for a variety of aerial assignments.

5. In January 1950, a rescue crew of trained mountaineers equipped with Army oversnow vehicles *(Weasels)*, skis, ah-

The Hiller *H-23* is as versatile in the air as the well-known jeep is on the ground.

kios, and ice climbing gear spent 3 days in reaching a crashed plane near the crest of a Yukon peak. On the third day after the crash, a helicopter was obtained. In less than 2 hours after take-off, the helicopter had picked up the injured and returned them to a hospital. It had returned for a second trip before the mountaineers reached the crashed plane.

6. Helicopter transport, in many instances, can make possible the rapid pursuit and exploitation of a routed enemy. Such tactics produce valuable savings in manpower and matériel.

7. Helicopter transport can be used to extricate surrounded units, eliminating many casualties and realizing considerable savings by the recovery of equipment which would otherwise be lost or destroyed.

8. Helicopters are a valuable means of transport for messengers and wire re-

connaissance for signal units. A signal battalion commander in Korea stated that the use of 1 airplane permitted him to take 20 jeeps off the road for messenger service.

9. Each combat engineer battalion has one helicopter to reconnoiter roads and bridges, locate fords on rivers, and assist generally in engineering work. These craft save time and speed up many miscellaneous tasks.

10. Approximately 70 percent of the observed fires of the field artillery are conducted from organic aircraft, and thus, through improved observation, the combat effectiveness of the artillery has been increased.

Naval Usage

Experiences of the Navy, in operations in Korea, indicate that the roles which the helicopter has performed justify changes in the configuration of major ships for the purpose of carrying these aircraft. They have been extremely useful as a communications link between ships, and between ships and land liaison groups, permitting conferences to be held among widely separated parties that were working together, resulting in increased combat effectiveness. Some consider that the helicopter is far superior to the conventional aircraft in the role of observing fire. The helicopter has certain limitations, but none peculiar to conventional type aircraft for comparable usage. Based on these experiences, it is anticipated that naval commands will be asking for larger numbers of helicopters.

Conclusion

Army experiences, in actual combat operations in Korea, have proved the value of helicopters. The potentialities and the advantages to be gained from the use of aircraft adaptable to operations in Army combat units are fantastic. With proper encouragement, this is one of the fields in which great advancements will be made during the next few years. The "flying truck" is something new, but we cannot wait until it is completely perfected to start using it. All the services should find them extremely useful. The future improvements in this new type of air vehicle, and in the techniques of using it, will be of great benefit both to the military services for military operations and to the civilian economy for commercial purposes.

There are some who consider the Army to be a less technical, less scientific service than the Navy and Air Force. Nothing could be further from the truth. Scientific emphasis through vigorous research and development programs is nowhere more vital than it is in the Army.

Secretary of the Army Frank Pace, Jr.

Progress Toward Decentralized Command

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The views expressed in this article are the author's and are not necessarily those of the Department of the Army or the Command and General Staff College.—The Editor.

THE Commanding General, Third Army, at his headquarters in Fort McPherson, Georgia, informs his assembled staff that all communications between the Third Army area and the Pentagon in Washington, D. C., have been disrupted by enemy action. Furthermore, it will be at least 6 months before any degree of command can be re-established by the Department of the Army, except for a single-channel contact from Fort McPherson. The Third Army will assume command at once and operate all Army installations and activities in its area.

This imaginative situation is not entirely illogical, nor is it the first consideration given this problem. In 1948, the Department of the Army conducted a 6-month territorial command test in the Third Army area. In this test, known as Operation *Tact* (Third Army Command Test), all Army units, activities, and installations within the geographic limits of the Third Army area, except for a few specifically exempted, were placed under the Commanding General, Third Army. To broaden the scope of the test, the port of New Orleans also was included, although the port geographically is located in the Fourth Army area.

General Background

The continental United States is divided into six numbered army areas, with an army commander for each area. Within each area, the Army installations are designated as either Class I or Class II. Class I installations are commanded by the army commander, while Class II installations are commanded by a Department of the Army Chief of Technical or Administrative Service. At most of the Class II installations, the army commander is responsible only for certain administrative functions.

Assumption of Command

The initial problem encountered by the Commanding General, Third Army, and his staff in Operation *Tact* was a determination of the nature, type, and scope of operations performed at each of the Class II installations in the Third Army area. Before the Third Army could exercise command intelligently, it was necessary to determine the:

Possible disruption of centralized control and the isolation of areas in the US may require army commanders to operate all activities in their areas. Operation 'Tact' demonstrated the feasibility of such an action

1. Mission of each installation in terms of scope, operating procedures, volume, and extent of operations. (Class II installations vary considerably in these factors. Even two Class II activities with the same general mission may operate in a totally different manner.)

2. Functional and staff organization of each Class II installation, to include an understanding of its capabilities and limitations. (Class II installations normally are organized on a Table of Distribution basis. A majority of the employees in each installation are civilians. Differences in mission and method of operation, with the several different technical and administrative services involved, result in wide variations in organization.)

3. Major problems confronting each installation in performing its mission. (Exercise of proper command requires the recognition of factors which restrict efficient operations. Problems in connection with Class II installations normally involve operating facilities, personnel, budget, equipment, materials, and transportation.)

Because of the previous limited responsibility of the army commander for Class II installations, little of the required information was available in the army headquarters. It had to be assembled and evaluated, however, before command could be fully effective. Previous experience in assuming command of Table of Organization and Equipment units proved to be of limited value, since the problems involved with large, fixed installations were found to be totally dissimilar.

As a result of this initial problem developed in Operation *Tact*, the Department of the Army subsequently issued a directive authorizing army commanders to inspect Class II installations in their area and review the operations performed by them. This authority will enable army headquarters to acquire some prior knowledge of these installations, and will facilitate their integration into the army area command, in the event such action becomes necessary in the future.

Unity of Command

The command structure presented another major problem. Prior to Operation *Tact*, Class II installation commanders were responsible to the Commanding General, Third Army, only for certain administrative functions such as reporting military strengths, law and order, and utilities. For operations, these commanders were directly responsible to the chief of the appropriate Department of the Army Technical or Administrative Service. The undesirable features of this dual command channel were recognized, and the Third Army's after action report on *Tact* stressed:

1. The accepted principle that a commander should be responsible to only one superior.

2. The fact that the army area commander's geographic proximity to Class II installations permitted him to exercise command and supervision more efficiently than could the Department of the Army Chiefs of Technical or Administrative Services.

3. That the Technical and Administrative Services should be released from operating so as to enable them to concentrate their efforts on policy, planning, and programming.

4. That the size of the technical and administrative service staffs in the Department of the Army should be reduced.

5. The fact that Zone of Interior army headquarters are organized for both tactical and administrative operations. A command and staff group is available in each army headquarters which can be used for a static administrative headquarters in the event the army is required to become a field army headquarters. Armies, therefore, would not require a headquarters reorganization, although some augmentation of existing staff sections would be necessary.

Nonconcurrence

However, the monitoring group, established by the Department of the Army to review the conduct of *Tact*, did not concur with the Third Army's recommendations. It was held that the Department of the Army's command of Class II installations to Class II installations provided for closer supervision, which permitted him to:

1. Develop uniformity in procedures.
2. More readily identify and appreciate problems of subordinate commanders.
3. Render decisions based on a more

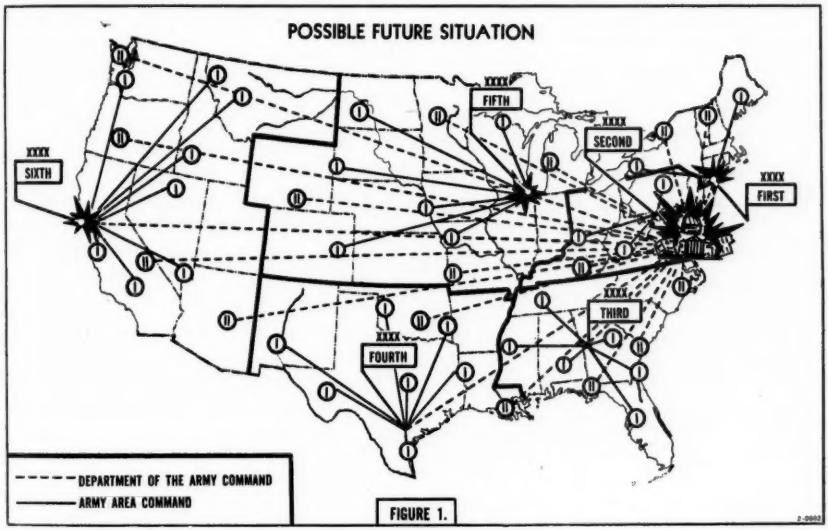


FIGURE 1.

achieved unity of command of *operations*, and that limiting the responsibility of the army area commander to certain administrative matters achieved the primary purpose of permitting economies in overhead. The monitoring group also stressed the fact that procurement, stock control, and the issue of Army supplies are on a national basis, so that top-level technical and administrative service channels would be essential under any command setup. It also was stressed that any reduction of personnel would be more than offset by increases required in each of our six army headquarters.

Despite these conflicting views, an impartial evaluation of Operation *Tact* definitely indicates that the proximity of the Commanding General, Third Army, intimate knowledge of the immediate circumstances.

The Department of the Army apparently has recognized these advantages, and has adopted a solution midway between the recommendations of the Third Army and the monitoring group. Under a directive later issued, army area commanders are required to inspect the operations of Class II installations, and to recommend corrective action where necessary to the Department of the Army.

Training Responsibilities of Armies

The Third Army cited the situation at Camp Gordon, Georgia, as an example of the army commander integrating Class II operations under a single command. The Provost Marshal General's School, the

Signal Corps and Engineer Aviation Unit Training Centers, supported by a Class I station complement, are located at Camp Gordon. Normally, two Technical Service Chiefs and one Administrative Service Chief and an army area commander issued directives in this one installation. Under *Tact*, the army commander co-ordinated and supervised all four activities. Policy guidance and control of the flow of trainees were provided by the Department of the Army.

The pattern for the successful implementation of the decentralized command of training facilities had been established previously, which simplified the Third Army's operations in this field. In 1947, the basic training centers, formerly under the Army Field Forces, were placed under the command of the army area commanders. There was an initial period of confusion until the armies acquired operational experience, and the training divisions became accustomed to army procedures. The Department of the Army controls the flow of trainees and the Army Field Forces provides the training policies for the basic training centers. This is an example of an Army-wide activity which has been decentralized to army area commanders and which appears to be working very effectively. The unified command of Camp Gordon's training activities, by the Third Army, was continued after the completion of *Tact*.

Army Area Defense

The defense of the army area was not stressed in Operation *Tact*. However, such activities will acquire more significance in the future. The army commander is responsible for the defense of the army area, and installation defenses form an important part of his plan. Each installation commander must prepare plans for the defense of his installation. Differences in the size, type, and location of installations, and the forces available for their defense, preclude any one plan being applicable to all installations. Nevertheless, the army commander must co-ordinate and integrate these installation defense plans if he is to be properly prepared to meet any emergency condition. This necessitates the:

1. Determination of the required defenses.

2. Determination of the forces available.

3. Preparation of the over-all defense plans.

4. Orientation of the subordinate commanders, staffs, and defense forces on these plans.

5. Preparation of a training program to ensure effective execution of the plans.

6. Preparation of a command and communications plan to co-ordinate all the defense plans in the army area.

In recognition of this necessity for co-ordinating emergency action, the Department of the Army has issued a directive requiring army area commanders to:

1. Inspect and review the training at Class II installations.

2. Submit recommendations for improvement or corrective action where necessary.

3. Obtain on request, from Class II commanders, a list of the troops which will pass to the control of the army commander in an emergency.

4. Assume control in an emergency, of all military personnel, supplies, and equipment in the army area.

Based on this authority, the army area commander is now in a position to recommend action which will ensure adequate integration of Class II installations into the over-all area defense plan.

Joint Interests

The Third Army's evaluation of *Tact* pointed out that centralizing the command of all Army installations in a geographic area simplified co-ordination with

the Navy and the Air Force, particularly with respect to defense plans.

Although the Assistant Chiefs of Staff, G1 and G3, Department of the Army, generally concurred in this view, the G4 did not. The nonconcurrence by the G4 was based primarily on the opinion that complete co-ordination on logistical matters could only be accomplished through the Department of the Army Technical Services, since it was felt that army area commanders do not have all the logistical information necessary.

As the situation now stands, complete co-ordination of the area's defense plans with the Navy and the Air Force cannot be accomplished at the army area level. However, the future will see added emphasis on joint projects, and the trend toward greater decentralization to army area commanders ultimately may result in the closer, if not complete, co-ordination between all three services on a geographical area basis.

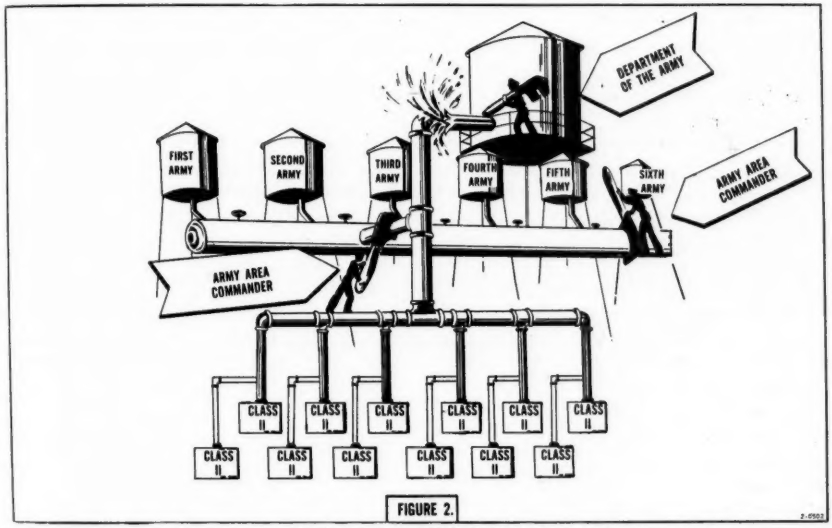


FIGURE 2.

If Department of the Army control of Class II installations is disrupted, the army area commander should be able to exercise immediate control over *all* installations and facilities in his area.

Personnel

Experience during *Tact* indicated that the army area commander could exercise a high degree of flexibility in the utilization of personnel. A consolidated personnel authorization and accounting for all Class II installations were found to be possible. Personnel assignments could be made, and vacancies filled, without the necessity of considering whether a Class I or a Class II installation was involved. Surpluses and shortages within the army area could be adjusted, without reference to the Department of the Army. *Tact* also ensured the application of uniform personnel procedures for both Class I and Class II installations, with resulting benefits from a morale standpoint.

It may be concluded that the personnel aspects of decentralized command do not present any major problems. The necessary centralized control of critical or specialist personnel can be retained by the Department of the Army through present

machine records cataloging methods, while still exploiting the many advantages of decentralization to army area commands.

The Assistant Chief of Staff, G1, Department of the Army, concurred in this view and recommended that the command of all Army installations be decentralized to the army area commanders.

Logistics

As previously indicated, the principal objection to the decentralized command concept, recommended by the Third Army, was registered by the logisticians. Although the Assistant Chiefs of Staff, G1, G2, and G3, Department of the Army, generally concurred in the practicability of decentralized command, the G4 considered that logistical considerations were paramount, and that these required the retention of tight, centralized control at the Department of the Army level. Based primarily on this objection, the monitoring group recommended against decentralizing the command of Class II installations to army area commanders. The following factors were cited:

1. The supply system of the Army, from procurement through issuance, is on a national basis. The proper integration of all factors involved in the Army-wide supply process requires a highly centralized control system.

2. Army supply is on a product basis along technical service lines, and the internal organization of each service is world-wide. The stocks in all supply depots must be available, potentially, to serve all areas of the world, without reference to army boundaries. A geographic command subdivision, therefore, would slow down supply to overseas forces.

3. The major industries of the United States are organized on a national basis. Few industries have area organizations which correspond to the army areas.

4. The decentralized command of logistical operations still would require considerable supervision by the Technical Services. National programming, procurement, the movement of supplies to overseas commands, and the control of regulated items are examples of world-wide functions which can best be controlled by a centralized agency.

Although it must be admitted that the world-wide aspects of the Army logistical system favor centralized control, it appears obvious that in any future emergency this centralized control agency—the Headquarters, Department of the Army—could be a high priority target. In the event of a successful attack, we might find ourselves in a situation comparable with that described in the opening paragraph of this article, with an enforced and immediate decentralization of control to geographical areas. The comment to the Assistant Chief of Staff, G1, Department of the Army, on *Tact* is timely. He stated: "While weighing the wisdom of any such change (the command of all Army installations in an army area by the respective army commander), the consideration that such decentralization might, in the event of war, be forced upon the Department of the Army by destruction of the central installations should not be overlooked." The wisdom of preparing for such a contingency is apparent.

Measures Necessary for Effective Decentralized Control

At this point, it may be appropriate to consider certain actions, over and above those already taken by the Department of the Army, to prepare for a greater decentralization to army area commanders, should such action be forced upon us.

The following measures are considered to be the minimum necessary, under the assumption that some degree of centralized control by the Department of the Army still will be possible:

1. Establish at least one general depot in each army area with a balanced level of supply adequate to meet the requirements for the army area.

2. Establish an additional general depot for each port with an Oversea Supply Division, the depot to be located in the same army area as the port.

3. Establish at least two general depots for highly technical and regulated items of world-wide significance. The stock control functions at these depots should be exercised by the Department of the Army.

4. Plan for the operation of rail and air transportation and pipe lines on an interarea basis, under centralized control, by the Department of the Army.

5. Plan for a continuation of the Department of the Army control over the flow of trainees, and for the direction of the programs for Army-wide training installations.

6. Provide for the exemption from the control of Army commanders of certain specialized activities such as the Army Security Agency and Corps of Engineers' civil works projects.

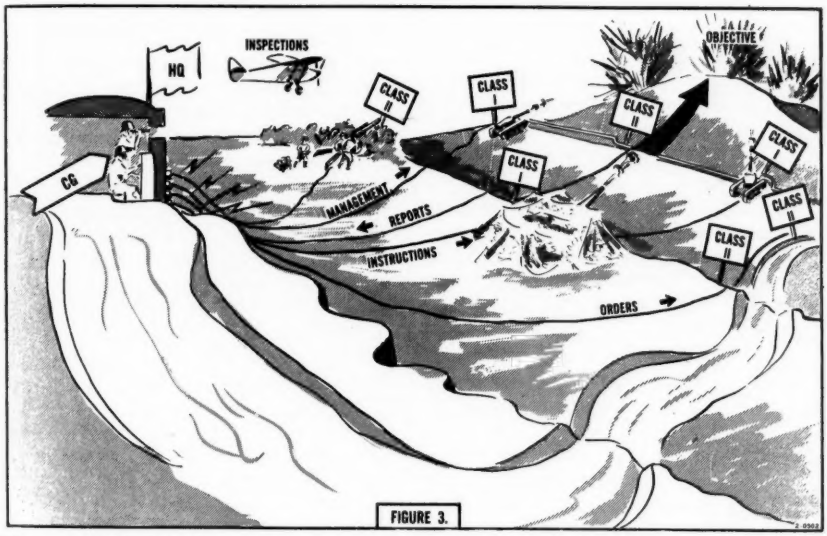
7. Continue the procurement of supplies, control of research and development, and the co-ordination of overseas supply by the Department of the Army.

Preparations for a *complete* decentralization to army area commanders are complex in the extreme, and further study is necessary before the problems involved can even be stated with any degree of accuracy. Some broader aspects of the situation are:

1. Preparation of the tactical and administrative components of the army headquarters for immediate effective functioning.

2. Assumption of the control of all transportation facilities in the army area, and the preparation of plans for coordinating the use of such facilities with adjacent areas.

3. Assumption of complete control over training installations, with the possible necessity for altering training programs



The proximity of the army area commander to all installations and activities in his area facilitates control and enables him to accomplish his mission more expeditiously.

to ensure the early availability of personnel.

4. Co-ordination with regional selective service officials to control the flow of personnel into the Army.

5. Initiation of full-scale procurement activities within the army area.

Summary and Conclusions

Operation *Tact* demonstrated clearly the many benefits to be obtained from decentralizing command to army area commanders. It further highlighted the difficulties involved, particularly in the field of logistics.

As a result of *Tact*, the authority of the army area commanders with respect to Class II installations has been broadened, and plans for assuming command of the entire army area now can be prepared more effectively. Nevertheless, a high degree of centralized control still is retained by the Department of the Army.

The possibility of complete disruption of centralized control and the isolation of any one geographical area of the United States may be remote. However, we must plan for such a contingency. Present procedures, therefore, should be closely examined, with emphasis on logistics, to determine whether further decentralization to army area commanders may be practicable. A timely analysis of the problem now will ensure the effective implementation of the concept of decentralized command, and will permit the operation, at maximum efficiency, of such separate military areas as may be required.

Inherent in our way of life is the potential to survive in a world threatened by a predatory philosophy backed up by unprecedented military forces—forces that we could not match for long without curtailing the very freedoms we seek to preserve. It is a unique quality of democracy that it inspires its citizens spontaneously and voluntarily to integrate into their peacetime pursuits, the development of the leadership and technical skills that we can draw upon in time of danger.

General J. Lawton Collins

Dispersion of Supply Installations In a Field Army

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The views expressed in this article are the author's and are not necessarily those of the Department of the Army or the Command and General Staff College.—The Editor.

THE supplies of a field army are its life blood. With these supplies in adequate quantities, the commander feeds and clothes his men, furnishes fuel and maintenance supplies for the army's vehicles, and provides the ammunition for the final victory over the opponent. Take away any appreciable portion of these supplies, and the weakness created becomes apparent. The army is handicapped, and is unable to bring its full power to bear against the enemy. The lack of spare parts for the repair of a wrist watch only may have a minute effect on the progress or success of a tactical operation. However, the loss of ammunition reserves may well cripple the fire power of the army. No amount of courage or bravery on the part of the fighting man can compensate for deficiencies in supply. A well-trained and seasoned enemy can equal us in manpower, individual bravery, and courage, but he cannot always match us in our ability to provide those supplies necessary to carry on a war successfully. Therein often lies the balance in favor of victory or defeat.

Supplies Required for a Field Army

The modern field army requires a tremendous quantity of all types of supplies to conduct operations. The rates of expenditure, of course, vary according to the number of troops in combat and service roles, the intensity of combat action, and the operating conditions inherent to the area such as weather, road net, and terrain. A field army of three corps, composed of nine infantry and three armored divisions plus supporting troops, consumes supplies at an average of 7,880 tons a day. Class I (rations), Class III (petroleum), and Class V (ammunition) supplies comprise the greater portion of the daily requirements. They include items of great bulk and weight which are relatively few in number. Class II and IV supplies (clothing, spare parts, and special equipment) are required in much smaller daily quantities than the preceding supplies. However, the problem in handling these classes of supply primarily is one of the number of items they include rather than tonnage.

If, for example, the maximum reserve level of supplies for a field army is the quantity required for 15 days, then the army commander has the problem of storing, protecting, and issuing approximately 118,200 tons of supplies of all classes.

To neutralize the threat of atomic warfare, depots in the combat zone must be dispersed. This applies equally to stocks in critical items, which must be divided among several installations to avoid total destruction

True, in some instances, certain types of supplies will be in the hands of using units, but the commander still must make plans for handling and storing at least 100,000 tons as a reserve for contemplated operations.

World War II Installations

During World War II, the supply installations for a field army were planned and located with one principle foremost in mind—that of accomplishing their assigned missions of effectively supporting tactical operations. Sites for depots, in maintenance areas, were selected in accordance with a number of factors; namely, the provision of:

1. Available covered storage for perishable supplies, medical equipment, spare parts, or other items subject to deterioration from extreme weather conditions.

2. Available open storage areas suitable for handling large tonnages of rations, gasoline, and ammunition. This also required the selection of areas whose topography permitted the erection of higher and more concentrated individual stock piles to conserve storage space.

3. Hard standings for maintenance units and vehicle parks in the maintenance area(s), and access roads in depots.

4. Adequate road nets to handle the daily volume of vehicular traffic normal to the supply operations of a field army.

5. Adequate rail unloading facilities within the maintenance area(s) to handle the heavy tonnages shipped from the communications zone.

6. Facilities for the service troops convenient to the depots to facilitate the receipt, storage, and issue of supplies.

Usually, within an army maintenance area, one depot was established for each branch and class of supply. All depots were grouped in one central location and were provided antiaircraft and combat troop protection, if the situation made that necessary.

Army supply points for the logistical support of divisions and corps troops were selected by using the same factors as those used in determining the location of depots in a maintenance area. However, several additional factors were considered, namely:

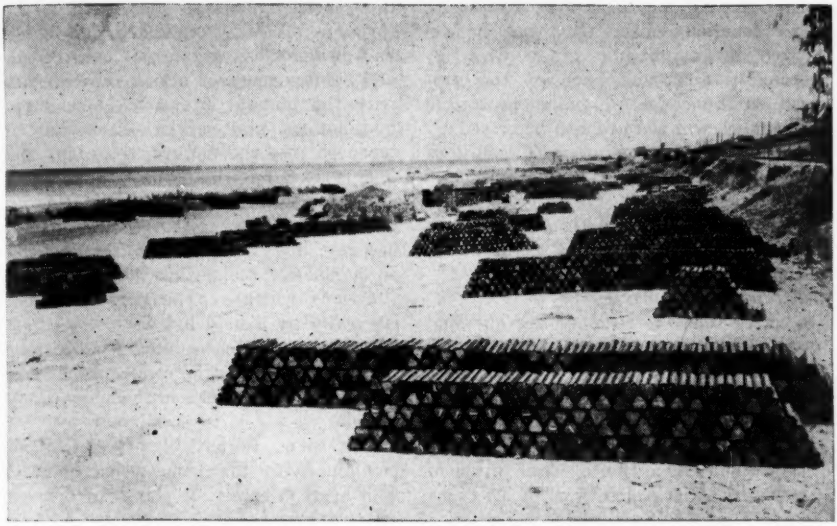
1. *Turn-around time.*—Army supply points were established within approximately 35 miles (or 8 hours turn-around time) of using units, thus enabling their field trains to replenish supplies within the hours of darkness.

2. *Distance from the front lines.*—The tactical situation was kept in mind, with supply points being placed well forward to support an attack. During periods when the troops were on the defensive or when the situation was static, supply points were established farther to the rear as a protection against a possible enemy penetration.

Measures Providing Protection

In the coming age of guided missiles and mass-destruction weapons, how must the field army commander protect his supplies which are so vital to the conduct of operations? Should greater reserves of supplies be placed in the hands of combat troops to ensure that supplies are on hand when needed, and thus reduce the quantities held in depots and supply points? Should the corps in a field army, primarily a tactical headquarters, assume greater logistical responsibilities and establish subdepots and supply points to support combat troops? Should the reserve supplies of an army be dispersed throughout its entire area, and thus reduce their likelihood of destruction? Should reserve supplies be concentrated in underground and protected storage sites? Should the army store less supplies and depend on air, sea, highway, rail, and pipe lines for the rapid replenishment of expenditures?

Obviously, the manner in which installations were located during World War II will not be acceptable in the future. We cannot risk placing the greater por-



Above, a Seventh Army Ordnance ammunition supply depot set up on the beachhead in Sicily to supply the combat troops battling their way across the island. Below, typical of many World War II storage areas is this full field of Class I reserve rations at a Quartermaster depot near Formiguy, France.—Department of Defense photographs.

tion of the supplies of a field army in a single location where they can be destroyed by an atomic blast. Only by thoroughly analyzing each of the proposed solutions for providing protection for supplies will the problem be solved.

An analysis of the proposed solutions discloses the following advantages and disadvantages:

Proposed Solution 1.—Greater reserves of supplies should be placed in the hands of combat troops.

Advantages:

Ensures that the supplies are on hand at the time they are required.

Disadvantages:

Places an additional burden on combat units who must store, guard, and transport the supplies.

Fails to reduce the over-all problem of protecting large quantities of all types of supply in the army maintenance area for the percentage of additional supplies which could be stored efficiently in the forward areas, with combat forces, is too small to be important.

Reduces the mobility of combat troops if their organic field trains are required to store and move large quantities of supplies.

Increases the probability of waste and the loss of supplies through mishandling, improper stock control, and enemy action.

Proposed Solution 2.—The corps, primarily a tactical headquarters, should assume greater responsibility for the storage and issue of supplies.

Advantages:

Places supplies closer to the consumer.

Relieves the army of a part of the responsibility for storing large quantities of all supplies.

Increases the dispersion of supply installations.

Increases the period during which the corps is self-sustaining.

Disadvantages:

Reduces the tactical flexibility of the corps by burdening it with supplies and the service troops to handle them. The corps, as presently organized, can pick up and drop combat support units with ease, and change zones of action in accordance with the tactical situation. Once supply installations and service troops are introduced into the picture, the corps must undertake supply planning, requisitioning, and storage, as well as the allocation and utilization of service troops. A corps then becomes, in reality, an army headquarters on a smaller scale, thus duplicating the functions which can be performed more efficiently by a field army.

Places an excessive amount of supplies too far forward in the combat zone where they are more vulnerable to enemy ground attack.

The corps cannot plan logistical operations with the same efficiency as a field army. Usually, it plans for only one or two tactical operations in advance, while the plans of a field army encompass longer periods of time. Thus, if all three corps in a field army were to plan for the logistical support of operations, each corps, to be certain of having ample supplies on hand, must requisition and stock the supplies necessary for all foreseen operations. Duplication of effort on the part of these corps could not be avoided.

Proposed Solution 3.—Supplies for an army should be dispersed throughout the entire army area.

Advantages:

Reduces the number of profitable targets on which an enemy can use mass-destruction weapons.

Disadvantages:

Spreads army supply installations over such a large area that stock control, proper guarding, and efficient operations would be almost impossible.

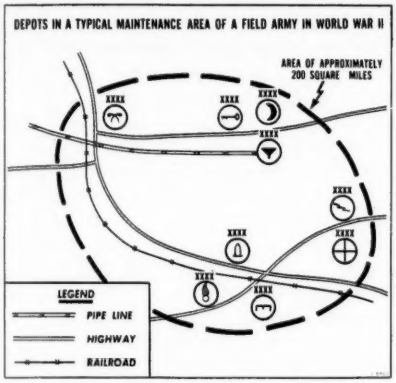
Requires more transportation and service troops to handle the supplies.

Proposed Solution 4.—Supplies should be concentrated in underground and protected storage sites.

Advantages:

Provides protection from enemy mass-destruction weapons and guided missiles.

Provides cover, concealment, and reduces the likelihood of the enemy discovering the location of supply installations.


DEPOTS IN A TYPICAL MAINTENANCE AREA OF A FIELD ARMY IN WORLD WAR II
AREA OF APPROXIMATELY 200 SQUARE MILES
LEGEND
PIPE LINE
HIGHWAY
RAILROAD

Disadvantages:

Construction of underground and protected storage areas and facilities is prohibitive based on manpower limitations and the construction effort available to the field army.

Proposed Solution 5.—The army should store less supplies and depend on air, sea, highway, rail, and pipe lines for the rapid replenishment of expenditures.

Advantages:

Reduces the quantity of supplies present in the army area.

Provides a system for rapid replenishment in case of the destruction of one or more items.

Reduces the risk of losing critical supplies by enemy action in the combat zone.

Disadvantages:

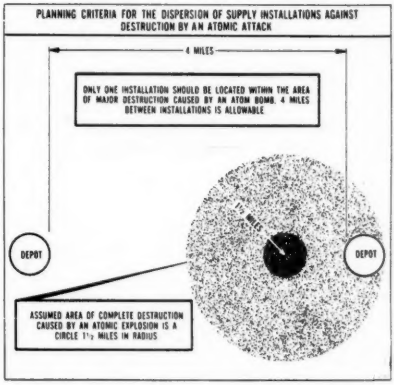
The army commander does not have the logistical means under his control to conduct operations effectively for a long period. His operations are more dependent on the immediate resupply capabilities of a supporting headquarters which is not under his command.

Places combat troops too far from adequate supplies. A disruption of the lines of communications, by weather or enemy action, may delay the replenishment of supplies to such an extent that a planned operation cannot succeed.

No ample reserve of supplies is available to ensure the continuity of operations. Should an abnormal demand for one or several items develop, reserves are not available to combat troops within a reasonable distance.

Recapitulation

All of the above alternatives have some advantages which might be adopted in part. However, the problem is to provide sufficient protection for supplies in the army area without increasing the number of service units and, at the same time, maintain the mobility of combat troops and the tactical flexibility of the corps. Within the field army, the protection desired can be obtained by dispersing supplies sufficiently to prevent any one installation from becoming a profitable target to the enemy. Assuming that an enemy will employ guided missiles with both ordinary and atomic warheads, provisions must be made for protection against the


PLANNING CRITERIA FOR THE DISPERSION OF SUPPLY INSTALLATIONS AGAINST DESTRUCTION BY AN ATOMIC ATTACK
4 MILES
ONLY ONE INSTALLATION SHOULD BE LOCATED WITHIN THE AREA OF MAJOR DESTRUCTION CAUSED BY AN ATOM BOMB. 4 MILES BETWEEN INSTALLATIONS IS ALLOWABLE
DEPOT
DEPOT
ASSUMED AREA OF COMPLETE DESTRUCTION CAUSED BY AN ATOMIC EXPLOSION IS A CIRCLE 1½ MILES IN RADIUS

possible destruction of stock piles by either type of weapon. The enemy may readily employ guided missiles with ordinary high explosive warheads against targets in the army area, but unless he has an unlimited supply of mass-destruction weapons, it is doubtful that he would employ an atomic weapon without carefully considering its effect on the entire operation.

Very likely, atom bombs will be expended very carefully. Therefore, other things being equal, the enemy will employ his atom bombs only against the most profitable targets. Adequate protection of a supply installation from atomic attack depends, to a large extent, upon its being a less profitable target or at least no more profitable a target than others within the enemy's attack capabilities. Dispersion should be sufficient to place supply installations on a parity with tactical installations in order to prevent them from being the more renumerative targets.

Dispersion of Installations

Dispersion of supplies against guided missiles or bombs containing ordinary high explosives can be accomplished within installations. Supplies should be so dispersed as to limit their destruction to those hit directly by a hostile weapon. Ammunition or inflammable material must be dispersed to the extent that one stack of supplies will not explode or catch fire as a result of the destruction of another near by.

The types of supplies within a depot must be so disposed that a single hit will not destroy all of one particular item. Thus, a guided missile attack on an installation, providing an atomic warhead is not used, will result in only a partial loss of the supplies therein.

The dispersion of depots against a mass-destruction weapon is another matter. As previously stated, depots, themselves, must be so dispersed as to prevent them from becoming profitable targets to the enemy.

From our standpoint, what are profitable targets as applied to supply installations? They are:

1. Installations which contain supplies that are essential for present and contemplated tactical operations, as, for example, stocks of guided missiles, of special propellants, or bridging equipment.
2. Installations containing supplies of such "money value" that we can ill afford to suffer their destruction, as, for example, costly signal equipment.
3. Installations containing critically needed supplies which will take a long time to replace, as, for example, locomotives and special engineer equipment.
4. A group of individually nonprofitable installations so located as to fall within the destructive area of an atom bomb.

So as not to present profitable targets to the enemy, it is evident that the installations falling within the above categories must be dispersed. To avoid "putting all our eggs in one basket," supplies found in installations falling within the first three categories should be duplicated. [The term *duplication*, as used in this article, refers to the division of available supplies between two or more locations. It does *not* mean that requisitions will be placed for *double* the amount of any given item or class of supply.]

Just how far apart should the installations be located? Can this dispersion take place in the present type field army without increasing service troops? What effect will dispersion and duplication have on the planning and execution of operations? These are the questions in the minds of the G4 and the technical service staff officers on the army staff who are responsible for the efficient supply of combat units.

Dispersion and Duplication

Considering the first question—how far apart should the installations be located?—

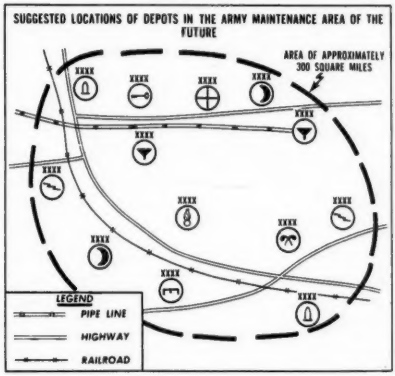
it is at once evident that installations must be so dispersed as to prevent more than one installation from being destroyed by an atom bomb. Let us assume that the area of complete destruction caused by an atomic air burst is within a circle with a radius of 1½ miles. Inasmuch as supply installations should not be so located that their concentration or grouping presents a profitable target to the enemy, it becomes necessary that the peripheries of each installation be at least 4 miles apart. Thus, no more than one installation will be within the area of that circle. As a measure of safety, 1 mile is added to the interval distance of 3 miles—the diameter of the circle—to provide a planning factor of 4 miles between the boundaries of the depots. If the mass-destruction weapons used by the enemy have a greater or smaller destructive area, then the distance between installations can be changed accordingly.

Considering the question in the minds of the planner—what installations are to be duplicated?—several factors mentioned previously must be considered, namely, their size, value, and importance to tactical operations.

Depots containing Class I, III, and V supplies are the largest from a tonnage standpoint and contain items which are essential to combat operations. Therefore, these depots should be duplicated. Class II and IV depots, containing items of supply of the various technical services, vary in value and importance with tactical operations. Of these, depots for signal, ordnance, and medical supplies usually are more important in the conduct of operations. However, substantial amounts of the latter two types of supply may be found in ordnance maintenance units and medical units farther forward in the army area. Signal supplies, on the other hand, not only have a high money value but also are critical and cannot be replaced readily. Thus, normally, the signal Class II and IV depot should be duplicated.

The assumption stated above—that only signal Class II and IV supplies are critical and that only the signal depot must be duplicated—does not always hold true. For example, winter clothing in a quartermaster Class II and IV depot may be a critical item, of high money value, and very important to future tactical operations. If such were the case, the planner should provide for a duplicate quartermaster Class II and IV depot, or, at least, divide the winter clothing items contained therein. The same concept holds true for the other technical services and it is the technical service staff officer on the army staff who is in the best position to recommend whether or not a depot should be duplicated.

With regard to the third question—can dispersion and duplication be accomplished within the troop strength of the present type field army without increasing service troops?—the present organi-



zation of service units is flexible enough to allow a reasonable solution to the problem. Quartermaster units operating one Class I and one Class III depot are capable of operating three of each, but with lessened efficiency. The handling of Class I and Class III supplies is largely a tonnage problem. The fact that duplicate depots will be established will *not* increase

the tonnage handled; only operations will be increased by virtue of having two separate installations instead of one. Similarly, ordnance units operating the Class V depot are capable of operating two depots. Again, the problem is not one of increased tonnage, but only that of augmented operations.

The operation of duplicate Class II and IV depots of the technical services, however, presents a different problem. Since these supplies present an item problem rather than one of tonnage, the duplication of any one installation doubles the difficulties inherent in receiving, storing, and issuing a large number of items. However, it is possible to duplicate a depot and then operate one for the issue of supplies and maintain the other on a standby basis. Thus, the necessary dispersion of critical supplies is accomplished, and the loss, at one time, of the entire army stocks of one item is prevented.

The duplication and dispersion of Class I, III, and V supply points in the forward areas to support combat operations can be solved readily. During World War II, it was common practice to establish one group of Class I, III, and V supply points in support of each corps. Where a corps' operations were extended over a wide area, it became necessary to establish more than one group to provide the desired logistical support. The quartermaster units provided in the type field army for the operation of Class I and III supply points can operate, if necessary, but with lowered efficiency, up to nine of each type in support of the three corps of the field army. However, six of each type of supply point will provide the dispersion and duplication required, that is, two Class I supply points and two Class III supply points for each corps. Ordnance ammunition companies, operating supply points in the forward area of the army, can operate six Class V supply points. Thus, there can be provided six sets of Class I, III, and V supply points—two for each corps—in support of combat operations. It is not intended that the tonnage of these supplies in the forward areas be increased even though the number of supply points is increased. The same amount of tonnage is handled by the same number of troops; only the number of locations is increased.

For the final question in the mind of the planner—what effect will this dispersion and duplication have on the planning and execution of operations?—the answer may be summed up by the phrase "increased effort." First, the size of the army maintenance area must be increased to accommodate the increased number of depots and the system of dispersed installations. Then, additional rail unloading facilities must be provided, and the road net in the maintenance area must be more extensive. Finally, provision must be made for the concealment and camouflage of supply and installations, to include the construction of dummy installations, to deceive enemy air observation.

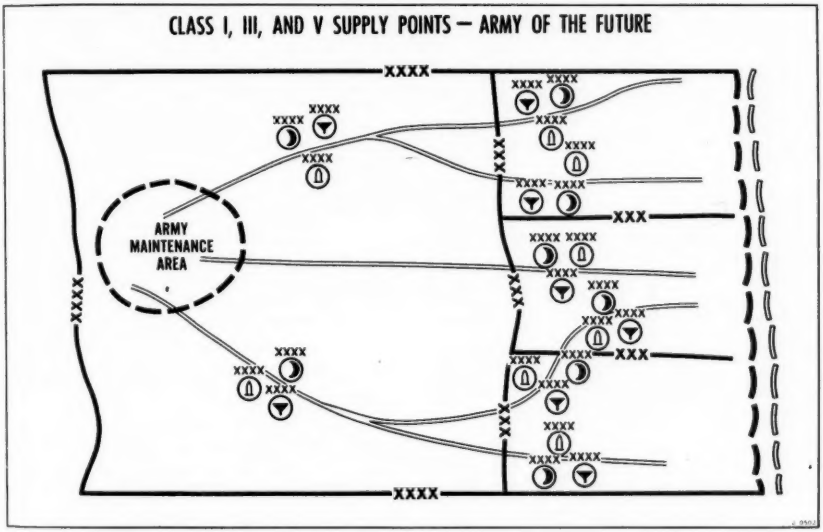
The duplication and dispersion of supply points in the forward areas actually benefit using units, as a greater number of issue points are at the disposal of combat troops. However, the establishment of two sets of supply points in each corps area increases the road net that must be maintained.

Defense of Supply Installations

The defense of dispersed installations against guerrilla forces, of course, is a problem. Service troops must be prepared to defend their own installations. Plans must be provided for the assembly of other service units, as a reserve, to move to an area under attack. Some additional protection can be provided by locating installations near combat and service troop bivouac areas.

The division of combat troops to assist in the defense of supply installations may be necessary if guerrilla activities are so intensified that they become a major threat to continued operations. Dispersed

installations may have to be consolidated even though the grouping will present a profitable target for an atomic attack. The probability, however, of the enemy employing an atom bomb in an area of intense guerrilla activity must be considered, for it is doubtful that large guerrilla forces will be active in any area that is subject to attack by mass-destruction weapons. It becomes obvious that before using an atomic weapon in an area in which its own guerrilla forces are operating, the enemy must decide whether the destruction of our resources outweighs the loss of their present and possibly future guerrilla effort.



Conclusions

1. The fundamental principles to be considered in locating the supply installations within a field army are:

a. The ability of the installation to provide adequate support of operations.

b. Its defensibility against an infiltrating enemy or guerrilla forces.

c. The provision of adequate dispersion against guided missiles and mass-destruction weapons.

2. The G4 and the technical service staff officers of an army must consider the following in locating depots in the army maintenance area:

a. Depots should be duplicated when the:

(1) Depot is sufficiently important to tactical operations.

(2) Depot stocks include items of great monetary value.

(3) Time necessary to replace critically needed supplies is long.

b. The minimum distance between depot peripheries should be at least 4 miles.

3. In order to provide the proper dispersion of supply installations in forward areas, two groups of Class I, III, and V supply points should be provided for each corps. The same criteria for dispersion and duplication which apply to depots in the army maintenance area also apply to supply points in the forward areas.

4. In dispersing installations, the staff planner must give consideration to the threat of enemy guerrilla forces. This threat must be weighed against the possibilitv of the enemy employing mass-destruction weapons in the area. In any event, the ultimate decision must be that which will result in the greatest protection to the supplies which are vital to the success of a field army in battle.

It is our principal job to develop an effective soldier but we also want our soldiers to regard their military service as a gratifying experience. When military service is ended, we want them to return to their homes prepared to be equally effective citizens or better ones than they were when they came into the Army.

General Mark W. Clark

MILITARY NOTES AROUND THE WORLD

UNITED STATES

X-Ray Camera

A new X-ray camera has been developed which makes it possible for the first time to take X-ray pictures of the entire human body.

The new camera will play an important role in medical practice, and particularly in orthopedic surgery, where physicians need a picture of the relationships of the various parts of the skeleton to each other.—*The New York Times.*

Cold Weather Battery

A lightweight storage battery that will start a vehicle at 65 degrees below zero has been developed by the University of Michigan Engineering Research Institute as an Army Ordnance project.

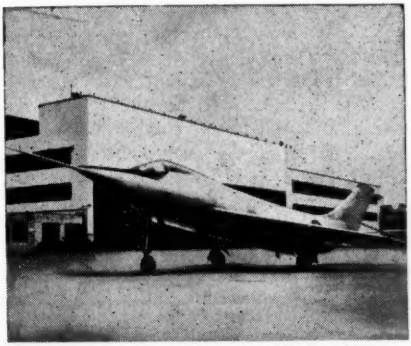
Urgently needed for military use in the far north, this improvement in the conventional lead-acid battery also is expected to have commercial application because it will not go dead when the vehicle has been idle for a time.

Large amounts of lead used in standard batteries are replaced with aluminum, brass, iron, and copper, making the battery lighter, yet more powerful.

The new battery has withstood operational tests at temperatures from 165 degrees above to 65 degrees below zero Fahrenheit.—*Science News Letter.*

Navy Jet

One of the Navy's newest jet fighter developments, the McDonnell *XF3H-1 Demon*, recently completed its first flight.



The Navy's newest jet—the *XF3H-1 Demon.*

Performance data on the new plane have not been released for publication.—News release.

First Aliens Enlisted

The first group of aliens to be enlisted into the US Army under the alien enlistment program recently reported to a European Command replacement depot in Germany.

More than 2,600 applications have been received, but only 2,500 will be accepted for enlistment.—*Army Navy Air Force Journal.*

Stratosphere Study

The Air Force hopes to get more information about the stratosphere out of a salt mine located 2,000 feet below the earth's surface.

Cosmic ray experts at Cornell's Laboratory of Nuclear Studies have been asked to make the underground studies for the Air Force; the project being part of an investigation of the relation between upper atmospheric conditions and cosmic ray intensity.—*The New York Times.*

Bag-Type Parachute

A new bag-type parachute, designed to minimize landing injuries, recently was tested at Fort Campbell, Kentucky.

The new chute is 4 feet wider in diameter than the one now in use and has an added skirt, approximately 1 foot wide, that extends over the edge of the chute. The most radical change is that the new chute is packed in a bag with the suspension lines stowed on the top of the parachute. When the jumper leaves the plane he pulls the suspension lines out before the canopy, allowing him to fall farther from the plane, and eliminating most of the opening shock. The larger canopy also assures a slower descent and easier landing, and the skirt edge is designed to prevent oscillation.—*Army Navy Air Force Journal.*

Equipment Rehabilitation Program

A vast program involving rehabilitation of about 200,000 tons of miscellaneous unidentified Army ordnance material left scattered through the Far East Command at the end of World War II has resulted in saving equipment which might have cost about 500 million dollars to replace.

Much of the equipment rebuilt as a result of the project, including some of the 50,000 vehicles which were reconditioned in Army ordnance shops in Japan, has been put to use in Korea.—*Army Navy Air Force Register.*

Ryukyus Aid

The Army has announced a $100,000 health and economic research program for Okinawa and the other Ryukyu Islands. Nine scientists have been appointed to help carry out the program.—News release.

Airborne Jeep

That mighty mite of military mobility—the Army jeep—soon may get wings. Plans now before the Army's research and development officials call for an airphibian—a jeep capable of operating in the air as a plane or on the ground as a wheeled vehicle.

The flying jeep's civilian counterpart has been approved by the Civil Aeronautics Authority, and soon will be in production. It can be converted from an aircraft to a road vehicle in less than 5 minutes and from a road vehicle to an aircraft in less than 7 minutes.

Plans presented to Army research and development officials outline a single engine, closed cabin, high-wing aircraft, which can be quickly convertible by one person without tools to a land operable vehicle.—*Army Navy Air Force Register.*

Aluminum Production

United States production of primary aluminum in the first half of this year reached the highest level since 1944, and topped the output of the first half of 1950 by 18 percent.—News release.

Impact Recorders

The Air Force has purchased 15 impact recorders in an effort to determine when, where, and how its equipment is damaged during shipping. Concealed inside a package, this device notes when a shock or impact occurs, the intensity of that impact, and from what direction the jolt came. By scanning the recorder's tape after delivery, packaging engineers can determine what happened, impact wise, along the package's route.—News release.

Production Increase

The Department of Commerce has announced that the production of goods and services in this country increased to a record annual rate of approximately 326 billion dollars during the second quarter of this year.

This total reflects a dollar increase of nearly 20 percent in the country's over-all production for the first 12 months of the conflict in Korea.—*The New York Times.*

'Dynamonster'

At the Army's Aberdeen Proving Ground, ordnance experts now have a machine to test machines. Called the "dynamonster," the 60-ton equipment tester is used to take the wrinkles out of all types of military vehicles.

The huge machine, built at a cost of $250,000, can measure the power and performance of anything from the smallest jeep up to the Army's heaviest tank.

The "dynamonster" gives information on such things as the pulling power of the engine, the speed of the vehicle, the amount of fuel it will use, its acceleration, and its maneuverability.

Ordnance men at the testing area claim the machine has saved millions of dollars and countless lives, by bringing out flaws before equipment is put into the hands of men in actual combat or training.—*Armed Forces.*

New Receiver Site

The largest receiver site in the Pacific, known as the Owada Receivers, was completed recently for Army, Air Force, and Navy traffic in Tokyo.

The new site is a tremendous improvement over the former one at Tsukishima Island, because Japanese industrial plants in the area interfered with radio reception, and the topography of the island made it subject to flooding during the typhoon season.—News release.

New Army Vehicle

Mass production of an entirely new military vehicle capable of carrying a 5-ton load at 58 miles an hour is planned by the General Motors Corporation.

The new model is bigger, faster, lower, easier to drive, easier to maintain, and

The Army's new GMC 6x6 cargo vehicle.

able to carry heavier loads than its World War II counterpart. It will be equipped with hydramatic transmission, providing eight speeds forward and two in reverse, and devices for traveling submerged in water on deep-fording operations.—News release.

Cyclone Furnace

Wider use of low grade coal is predicted with an improved type of cyclone furnace now being tested.

A cyclone furnace is a relatively new device which burns crushed coal and other fuels in a whirling tornado of flames within a cylindrical chamber. Fuel and preheated air are injected under pressure at one end of the unit, and high temperature gaseous products are emitted at the other.

Action of the furnace coats the walls of the chamber with a molten layer of ash into which the fuel is thrown by centrifugal force. Combustible materials burn, giving up heat, and the noncombustible residue melts and drops into a pit as slag.—*Science News Letter.*

National Guard Training

The Department of the Army has announced that 13,265 National Guardsmen attended Regular Army training schools during the fiscal year 1951, and that 35,631 Guardsmen were enrolled in Army extension courses during the same period —a record high for both types of training.—News release.

Modified 'Boxcar'

A revised model of the "Flying Boxcar" is under construction and soon will be ready for its first flight.

The most obvious change in this troop and cargo carrier, designated the *C-119H*, will be an increase in the wing area to enable the plane to fly at lower minimum flying speeds, take off and land in shorter distances, and carry greater loads than its predecessors. It will carry a payload of 25,000 pounds for a 1,500-mile range.

Other features of the *C-119H* include: (1) improved stability and control; (2) improved single engine performance, long-range cruise characteristics; (3) a newly designed rough field landing gear; (4) a new cockpit bailout hatch for pilot and crew; (5) greater center of gravity range of cargo location; (6) increased horizontal tail clearance for paratroop and cargo drops; (7) a reinforced fuselage for greater safety under crash conditions; and (8) individual heaters for wings, tail, and fuselage to eliminate ducting.—*Armed Force.*

Quartermaster Laboratory

Plans are under way for a new 11 million dollar Quartermaster research and development laboratory to be located near Natick, Massachusetts.

The new laboratory, to be built on an 84-acre site, will bring together most of the Quartermaster Corps research and development activities. Excepted only will be those related to food and containers, which will remain in Chicago.—*Army Times.*

Small Minesweepers

The Navy has developed new "piggy-back" minesweepers, which will be carried by mother vessels and then turned loose on the spot to clear mine-infested waters.

Development of the new minesweepers by the Navy will enable fast task forces to operate at peak efficiency in enemy waters. During World War II, independent naval forces frequently were hampered by mines because they did not always have the relatively slow minesweepers accompanying them to clear their way.—*Ordnance.*

Arctic Uniform

A new Arctic uniform, lighter in weight but affording better protection against extreme cold and more freedom of movement than its World War II predecessor, has been developed by the Army Quartermaster Corps.

The new Arctic clothing assembly, like the present Arctic uniform, is based on the "layer principle." It was subjected to extensive testing in Alaska last winter and gave satisfactory protection to moderately active troops at temperatures as low as 50 degrees below zero; the coldest weather encountered by the test teams. With the former uniform, the wearer began to feel chilled at about 25 degrees below zero.—*Army Times.*

Airplane Muffler

An airplane engine muffler that cuts down plant noise by about 50 percent was demonstrated recently on a *C-47* air transport, and observers agreed that engine noise was little more than "a low swoosh" at altitudes of 500 feet or more. The same muffler soon will be available for *C-46* air transports.

In the past, mufflers to cut down aircraft engine noise usually have reduced power by creating back pressures in the engine. The new muffler did not cause a reduction of engine power.—*The New York Times.*

Radioisotopes

To assist in extending the scope of international co-operation in science, the United States Atomic Energy Commission has enlarged its radioisotope export program to include all types of radioactive materials now sold in this country on an unrestricted basis.—*Science News Letter.*

Marshall Plan Aid

The Economic Co-operation Administration has halted dollar aid for Sweden and Portugal because these two Marshall Plan nations have made such good recoveries that they no longer need United States help.

They are the third and fourth nations to have their Marshall Plan aid suspended. The agency stopped aid to the United Kingdom and Ireland earlier this year.—News release.

Jet Version B-36

A new 8-engine jet version of the *B-36* superbomber is under construction for the Air Force. This swept-back wing plane is so different from the present 10-engine *B-36* that the Air Force has designated it the *YB-60.* The new bomber's performance is expected to exceed that of the *B-36.*—*The Kansas City Star.*

Punch-Press

Engineers of the Lockheed Aircraft Corporation have designed a 1,000-ton impact extrusion punch-press which will spread metals like butter in the production of airplane parts.

The punch-press will be capable of producing parts measuring up to 12 square inches in cross section and 24 inches in length. Airplane parts produced by impact extrusion are stronger than similar parts machined from castings on a lathe or drill press, as well as being more economical to produce.—*Science News Letter.*

CANADA

Arms Aid

Canada recently made a 50 million dollar gift of arms and equipment to Italy. Previously, Canada had made arms contributions to Belgium, Luxembourg, and the Netherlands.—News release.

Defense Agreement

Canadian and United States civilian defense officials have agreed on a plan to lift restrictions along the 3,500-mile US-Canadian border in the event of an atomic attack on North America.

Under the plan, Canadian provinces and American states would be free to set up co-operative civil defense organizations. Customs, immigration, and communications restrictions that normally apply at border points would be lifted. Fire fighting equipment, hospital units, ambulances, and personnel would be exchanged freely.—News release.

Petroleum Production

Canada's recently discovered oil fields in Alberta soon may make that country independent of petroleum products imported from the United States.

In 1947, when the first oil strike in Alberta was made, Canada was producing only about 7 percent of the oil she consumed. Alberta fields now meet about one-third of Canada's needs of 350,000 barrels daily.—*Science News Letter.*

Armed Forces Increase

Canada has announced that her armed forces have increased from 46,886 to 82,139 men during the past year.

This 75 percent increase has been obtained entirely by voluntary enlistment. The number of trained reserves available now is sufficient to assure replacement of every man with a minimum of 12 months' service, including a winter in Korea, if no unforeseen developments occur.—*The New York Times.*

AUSTRALIA

Adopt British Rifle

The new British .28-caliber rifle will be used by the Australian Army, according to an announcement by the Army Minister. The United States and Canada have approved a .30-caliber rifle.—News release.

Defence Preparation Act

Drastic executive powers to strengthen the Australian economy as a war precaution measure have been given to the Federal Government in the Defence Preparation Act, recently passed by Parliament.

The act gives power to the Government to make regulations for and in relation to: (1) expansion of Australia's capacity to produce or manufacture goods or provide services for defense preparations and to enable the economy to meet probable demands upon it in time of war; (2) diversion and control of resources, including money, materials, and facilities; and (3) securing the maintenance and sustenance of the people of other countries associated with Australia in defense preparation. It does not authorize regulations in relation to borrowing of money, compulsory direction of labor, or compulsory service in the armed forces.—*Australian Weekly Review.*

Oil Refinery

Australia's oil production will be increased by 40 percent when a new refinery, using the catalytic cracking process, begins operations at Altona within 3 years.

The new refinery is expected to have an annual production rate of more than 160 million gallons.—*The New York Times.*

COLOMBIA

Floating Drydock Planned

The Colombian Navy has announced plans for a floating drydock at Cartagena. It will be built by a Swedish concern, and will be able to handle ships up to 18,000 tons.—*The New York Times.*

BRAZIL

Coal Plan

The President of Brazil has asked Congress to take steps to improve that country's coal mining industry by adopting a 5-year plan and expending more than 40 million dollars. This plan provides for the purchase of modern mining machinery, better transport facilities, and the improvement of coal loading piers.

Present coal production in Brazil totals more than 2 million tons a year.—News release.

FRANCE

Industrial Output Up

French industrial production reached a record in June with an over-all production index—not counting building trades—of 143 points. A base of 100 points was established in 1938.—News release.

Strategic Materials

The French Government has agreed to sell the United States up to 7,200 tons of graphite and up to 500 tons of phlogopite mica, both needed for the United States defense program.

Graphite is an ingredient in steel production. Phlogopite mica is indispensable to the Western defense program as it is the only substance that can be used as an insulator in certain forms of electrical and electronics equipment. It also is used in the manufacture of aviation spark plugs, marine compass dials, radio condensor films, and bridges in radio tubes.—*The New York Times.*

Weapons Development

The French Defense Minister has announced that France has set "an all-time record" in developing new weapons with which to modernize her armed forces. He stated that new weapons, now being mass produced, were "designed, tested, and ordered" between April and November of last year.—*The New York Times.*

GREAT BRITAIN

Triple Flight Refueling

According to reports, tests are now going on in Great Britain with probe-and-drogue refueling, in which three planes are refueled simultaneously from a single tanker. The tanker, a *Lancaster* or *Lincoln*, trails probes from each wing tip as well as from the rear fuselage.—*The Aeroplane*, Great Britain.

Census Report

The population of the United Kingdom was placed at 50,368,455 in a report published recently on the census taken last April. The figure covers all of the British Isles except Ireland.

The total for Greater London is 8,346,137, an increase of only 130,364 since the last census, taken in 1931. This reflects a decrease of about a million in population of the County of London, which is attributed to the effects of the destruction from German bombing during the war.—*The New York Times.*

Ship Construction

Britain's shipbuilding industry has under construction, or has orders for, an all-time record of 5,500,000 gross tons of new shipping.

This represents 4 years' work at the present rate of output, and also dispels fears in the industry that unemployment would follow the postwar boom in shipbuilding and ship repair.—*The New York Times.*

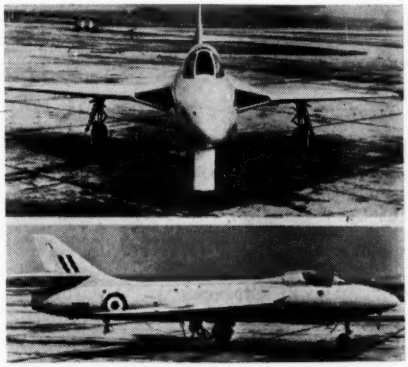
Steel Rationing

Steel rationing recently was reimposed in Britain, to take effect in December, with priority for export and rearmament industries on the purchase of carbon steel.

Roughly 95 percent of the steel used in that country is carbon steel. Controls over the distribution of alloy steel will be announced later.—*The New York Times.*

British Jet Fighter

A new British jet plane described as "the best fighting aircraft in the world" is currently in production for the Royal Air Force. Known as the Hawker *P-1067*,



Front and side view of the Hawker *P-1067*, the Royal Air Force's newest jet fighter.

it is a swept-wing intercepter powered by a Rolls-Royce *Avon* engine.

The RAF ordered the fighter "off the drawing board," thus enabling the manufacturer to plan mass production before the prototype left the plant on its first flight.

Details of the plane's speed, range, and armament are still classified.—British Information Services.

Jet Fuel

The British are looking toward motor fuel for their jets. Standard British jet fuel is kerosene, but it represents only a fraction of crude oil—some 7 to 10 percent. Much larger quantities of aviation gasoline and motor fuel can be refined from crude, and British engines can use these fuels. However, they have the disadvantage of boiling at low temperatures and atmospheric pressures, and of catching fire more easily.—*Aviation Age.*

SWEDEN

Expand Security Forces

A special corps of security policemen, consisting of 14,000 men, is being organized in Sweden to augment the country's security force. The members of the special corps will carry combat arms, and their training will include the use of methods to prevent sabotage.—*The New York Times.*

SWITZERLAND

Air Raid Shelters

Every house in Switzerland will have its own air raid shelter if Parliament approves a new bill.

The Government proposes that the building of air raid shelters be made compulsory for all houseowners. According to the proposal, it would extend a credit of $11,700,000 to cover 10 percent of the construction costs of the air raid shelters. The cantons and the communities would contribute another 10 percent. The other 80 percent would be borne by the houseowners, who will be authorized to get the money back from tenants by increasing rents over a period of 10 years.—News release.

YUGOSLAVIA

Arms Mission

The Yugoslav Government is preparing to dispatch a military mission to Washington to begin technical discussions concerning the re-equipment of the Yugoslav Army by the United States.—*The New York Times.*

HUNGARY

Ersatz Materials

Hungarian industries have announced that they plan to use *ersatz* materials to an increased extent in manufacturing. For example, automobile bodies henceforth will be built out of "refined wood," and engine parts will be made of steel substitutes.—News release.

WESTERN GERMANY

Trade Agreement

Western Germany and Japan recently signed a new trade and services agreement. It increases the previous agreement by 15 percent and calls for a yearly exchange of goods and services valued at 30 million dollars.—News release.

Derequisitions

More than 7,000 pieces of property in the United States zone of Germany formerly used by US forces have been returned to German control.

Each of the items, ranging from hotels to sports fields and from hospitals to huge apartment blocks, has reverted to German jurisdiction through the US Army's and Air Force's efforts to reduce, to the fullest extent possible, the amount of German property holdings under the control of US forces.—*Information Bulletin:* (Office of the US High Commissioner for Germany).

EASTERN GERMANY

Canal Construction

Soviet zone Germans are building a canal around Berlin to make East Berlin free of any counterblockade measures that Western authorities might impose.

East German Communists already have constructed a railway network circumventing West Berlin.—News release.

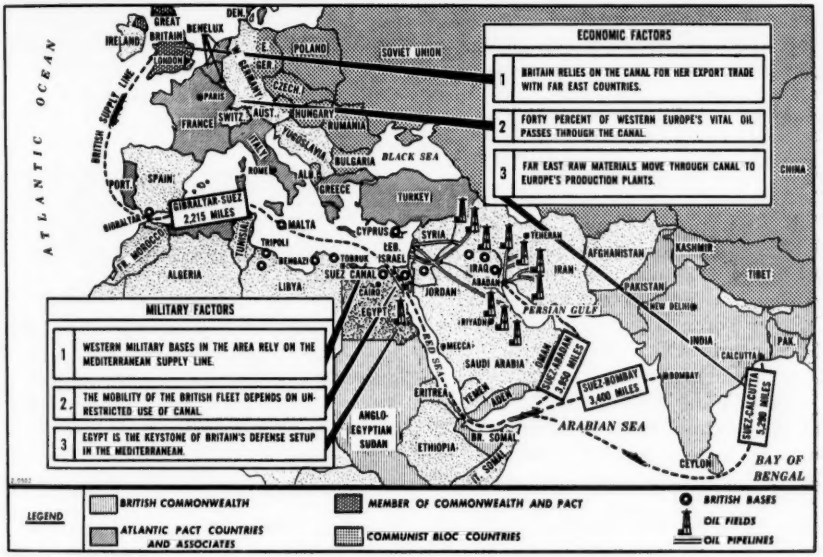
COMMUNIST CHINA

Military Increase

A larger air force, more artillery, and new weapons have been promised to the Chinese Communist "volunteers" in Korea by their commander. This statement paralleled that of the Chinese Communist Army's commander in chief who stated that the main force of the Chinese Army was being transformed from a purely land force into a land, naval, and air force capable of waging co-ordinated warfare.—*The New York Times.*

MIDDLE EAST

Strategic Importance of the Suez Canal—The Military and Economic Factors


ECONOMIC FACTORS
1 BRITAIN RELIES ON THE CANAL FOR HER EXPORT TRADE WITH FAR EAST COUNTRIES.
2 FORTY PERCENT OF WESTERN EUROPE'S VITAL OIL PASSES THROUGH THE CANAL.
3 FAR EAST RAW MATERIALS MOVE THROUGH CANAL TO EUROPE'S PRODUCTION PLANTS.
MILITARY FACTORS
1 WESTERN MILITARY BASES IN THE AREA RELY ON THE MEDITERRANEAN SUPPLY LINE.
2 THE MOBILITY OF THE BRITISH FLEET DEPENDS ON UNRESTRICTED USE OF CANAL.
3 EGYPT IS THE KEYSTONE OF BRITAIN'S DEFENSE SETUP IN THE MEDITERRANEAN.
ATLANTIC OCEAN
BRITISH SUPPLY LINE
GIBRALTAR-SUEZ 2,215 MILES
SUEZ-BOMBAY 3,400 MILES
SUEZ-CALCUTTA 3,300 MILES
SUEZ-ARABIAN 1,800 MILES
ARABIAN SEA
BAY OF BENGAL
PERSIAN GULF
RED SEA
BLACK SEA
SOVIET UNION
CHINA
LEGEND
BRITISH COMMONWEALTH
ATLANTIC PACT COUNTRIES AND ASSOCIATES
MEMBER OF COMMONWEALTH AND PACT
COMMUNIST BLOC COUNTRIES
BRITISH BASES
OIL FIELDS
OIL PIPELINES

ITALY

Advisory Mission

Italy and the United Nations have signed two agreements under which an advisory mission of six UN technical experts will spend 3 months in the Italian trust territory of Somaliland.—*The New York Times.*

AUSTRIA

Receive US-Equipped Mill

A 3 million dollar rolling mill, installed in the nationalized former Hermann Göring Steel Works in Linz with Economic Co-operation Administration (ECA) aid, recently was handed over to the Austrian Government by the United States.

The mill is part of the 10 million dollars in steel making equipment that will be furnished by the ECA to what is called the United Austrian Steel Works.—*The New York Times.*

NORWAY

Loan Pact

Norway recently signed an agreement for a loan of 24 million dollars with which to build an aluminum factory at Sundalsoera. The money came from Marshall Plan counterpart funds in Norway, Denmark, Western Germany, and France, from whom Norway will buy the needed equipment. Norway will pay the United States back with 7,000 tons of aluminum a year for 10 years.—News release.

BURMA

Trade Agreement

The Burmese Government recently announced that it had signed a trade agreement with Japan providing for an exchange of goods valued at 280 million dollars between the two countries in the coming year.—News release.

WESTERN EUROPE

Allied Airfields

By the end of this year, the allies expect to have about 80 fighter and bomber fields in Western Europe. By the end of 1953, when the build-up in Europe is to reach an effective and efficient size, there should be 200 bases.—*Aviation Age.*

INDIA

First Plane

The first airplane ever designed and built in India recently completed its initial flight. The plane, a two-place basic trainer, has been designated the *HT-2.* The Air Force is expected to order 300 of the planes.—News release.

FOREIGN MILITARY BRIEFS

Great Britain recently offered retirement bonuses and higher pensions to members of her armed services in an effort to win more men and women to lifetime careers.

Ecuador recently donated a million pounds of rice to the United Nations forces in Korea.

The West German Government has proposed that the United States supply 60 armored cars for use by the 10,000-man frontier force.

Sweden's foreign trade showed an import surplus of $112,770,000 for the first half of this year, compared with $38,360,000 for the same period last year.

West German exports hit a new postwar record of 315 million dollars during July. The previous record was set in June with 297 million dollars.

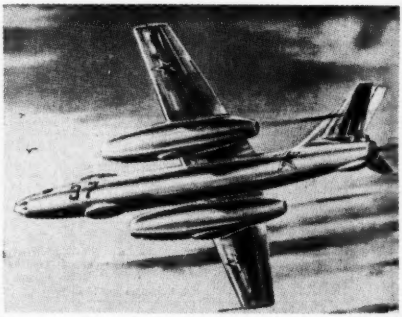
An organization called "Ready for work and combat movements" has been founded in Hungary to train men and women in street fighting, sabotage, and police discipline.

USSR

Soviet Jet Bomber

The Soviets in Eastern Europe are flying a fleet of new jet bombers which were built for the express purpose of running interference for the Soviet infantry.

Powered by twin jet engines, the new plane is larger, faster, and harder hitting than the propeller-driven *Stormoviks* with



The new Soviet twin-jet bomber—the *TU-10.*

which the Soviet Air Force helped turn back the German armored divisions during the last war. The Soviets call it the *TU-10.*

Two items of the *TU-10's* equipment make it stand out. One is apparently the first Soviet production version of a compact navigational-search radar installation. The other is a new jet engine, the *M-018,* which develops 7,700 pounds of thrust and has an afterburner for extra bursts of power.

The *TU-10* is manned by a crew of three—a pilot, a bombardier-radar operator, and a crew chief who doubles as tail gunner. It compares closely in size and performance with the British-developed *Canberra* jet bomber.—*Popular Science Monthly.*

Electric Ship

The Moscow radio has announced that the Soviets are developing an electric ship that will operate like a trolley bus, with long poles connecting to power lines along river banks.—News release.

The Balance of Sea Power

Digested by the MILITARY REVIEW from an article by Raymond V. B. Blackman in "The Navy" (Great Britain) June 1951.

IN PRESENTING the Navy Estimates, the Parliamentary and Financial Secretary to the Admiralty said that it was clear that the balance of sea power had tilted away from us very dramatically during the last 10 years. What he did not say was that the balance of sea power has been tilting away from us for the last 50 years.

Where is the process going to end? Will the balance of sea power continue to tilt away from us until we are reduced to the possession of a third- or fourth-class navy, suitable only for the coastal defense of this island alone, and we are dependent on the United States for the broader implementation of sea power covering the seven seas in general and our commercial life lines in particular?

Already the United States maintains a considerable "task force" in the Mediterranean, where before the "White Ensign" was represented by a mighty British fleet comprising powerful squadrons of battleships, aircraft carriers, and cruisers, and large flotillas of destroyers, escort vessels, and minesweepers. And in the Far East, the American fleet is paramount, whereas, in the not so far distant days, United States warships there constituted a small force not comparable with the substantial British fleet on the China Station. Can we detect a tendency for the Mediterranean countries near us, and for Australia, New Zealand, and Canada farther afield, to look to the United States Navy as *The Navy* which will "be there" in an emergency in their respective spheres, rather than to the Royal Navy which has always enjoyed that prestige in the past?

There seems to be a tendency—a complacency—to accept the fact that the balance of sea power is tilting away from us, on the premise that we are a small island, capable of supporting only that proportion of naval power commensurate with the population and resources of Great Britain. However, are we not a group of united states in our own right? Do not the independent countries of the Commonwealth, bound together under the common symbol of the Crown, constitute a United States? Does not the entity of the British Commonwealth, with its tentacles, and its commerce, assets, and enterprise all over the world, merit a larger Royal Navy than we have at present? Today, it is hardly large enough to safeguard our interests in more than one part of the world at a time.

Once the Most Powerful Navy

Some 50 years ago, the Royal Navy was overwhelmingly the most powerful navy in the world. It comprised 640 warships, including 74 battleships, 166 cruisers, and 400 destroyers, sloops, gunboats, torpedo boats, and submarines. The French Navy was second in importance, with 440 warships, and Germany had the third most powerful fleet, with 260 vessels. Russia ranked fourth, possessing 250 ships. The United States was fifth, having 210 vessels, and Japan was sixth with 150 ships. Italy came seventh with 110 vessels, followed by Austria-Hungary, the Netherlands, and Spain, in descending order.

World War I Position

By 1914, the Royal Navy consisted of 84 battleships (including 10 battle cruisers), 125 cruisers, 225 destroyers, 109 torpedo boats, 75 submarines, 50 gunboats, and 60 minesweepers and fleet auxiliaries. The eight naval powers in order of strength were Great Britain, Germany, the United States, Japan, France, Italy, Austria, and Russia.

During World War I, the Royal Navy lost 16 battleships (including 3 battle cruisers), 29 cruisers, 8 monitors, 69 destroyers, 58 submarines, 25 sloops and gunboats, 26 minesweepers, 11 torpedo boats, and 133 other vessels—a total of 375 warships.

During those 4 years of hostilities, however, Great Britain built hundreds of warships to replace losses and to prosecute the war, so that at the time of the Armistice, the Royal Navy comprised more than 5,000 warships, including 72 battleships and battle cruisers, 13 aircraft carriers, 129 cruisers, 433 destroyers, 137 submarines, and 160 torpedo boats. Britain was still, by far, the greatest naval power.

World War II Position

However, by the beginning of hostilities in 1939, such had been our dissipation and profligacy that we had only 580 warships, including 12 battleships, 3 battle cruisers, 7 aircraft carriers, 63 cruisers, 179 destroyers, 57 submarines, and 21 motor torpedo boats.

The order of the great naval powers was Great Britain, the United States (a near runner-up with 15 battleships, 5 aircraft carriers, 35 cruisers, 215 destroyers, and 87 submarines), followed by Japan, France, Italy, Germany, and the Soviet Union.

During World War II, the Royal Navy lost 1,600 warships, including 3 battleships, 2 battle cruisers, 10 aircraft carriers, 30 cruisers, 140 destroyers, 73 submarines, 122 motor torpedo boats, 16 armed merchant cruisers, 1 monitor, 4 minelayers, 74 sloops, frigates, and corvettes (all types now classed as frigates), 25 motor gunboats, 128 motor launches, 11 gunboats, 83 minesweepers, and 900 miscellaneous craft.

Shipbuilding Efforts

In wartime, both Great Britain and the United States made strenuous shipbuilding efforts, and, in spite of losses, the two largest navies of between the wars were still larger after hostilities. However, the United States outstripped this country in building new warships, and although the Americans have made some reduction in their warships since the end of hostilities it was nothing like the wholesale scale in Great Britain, where, since the end of the war, 10 battleships and a battle cruiser have been broken up; 40 aircraft carriers (including escort carriers on lease-lend terms) have been scrapped, reconverted for mercantile service, or returned to the United States; 35 cruisers have been broken up, sold, or discarded; and 150 destroyers have been scrapped or transferred to other countries. In addition, 100 frigates and 75 submarines have been eliminated from the active fleet. Yet, not a single warship of any of these categories (apart from eight destroyers ordered dur-

ing hostilities) has been laid down in this country since the war.

The result is that the balance of sea power has tilted away from us, though not so dramatically during the last 10 years as during the last 5½ years. The Royal Navy is no longer the largest in the world. It has dropped to second place, and a very bad second, too. The United States Navy is now four or five times larger in ships alone and six times larger in personnel. While we have 143,000 officers and men, the United States Navy has 850,000, which is precisely the number we had at the end of the war, giving an indication of our terrific run-down.

Soviet Naval Strength

The Soviet Navy now is believed to rank a good third in order of strength. France is fourth and Italy fifth; followed in descending order by Sweden, the Netherlands, Turkey, Spain, Argentina, Brazil, and Chile.

The Soviet Union is believed to be concentrating on the construction of submarines (of which she already has 360) with the figure of 1,000 in mind under a 5-year plan. To a lesser extent, she is devoting attention to cruisers and destroyers. It follows that the balance of naval power, as far as we and the United States are concerned, must be redressed by the maintenance of large numbers of antisubmarine vessels and a sufficient number of cruisers, for dealing with any enemy surface warships. However, in this country no cruisers and no frigates have been laid down since the end of the war, although recently some frigates have been ordered.

Weakness in Cruisers

The Royal Navy's weakness in cruisers has been manifest ever since 1947-48. At present, there are only 11 operational cruisers for emergencies all over the world, to show the "flag," and to police the many hundreds of thousands of miles of British trade routes upon which some 6,300 merchant ships are operating.

The recent switch of the cruiser *Gambia*, and then the *Euryalus*, from the Mediterranean fleet to the East Indies Station to be available for emergencies in the Persian Gulf, serves to emphasize again the Royal Navy's weakness in cruisers on foreign stations. Events over the last 3 years have proved time and time again that the number of cruisers maintained on each foreign station is inadequate to meet the emergencies of even normal peacetime police duties, let alone situations which might flare up into hostilities on a considerable scale.

Some 3 years ago, there were simultaneous incidents in the Falkland Islands, Honduras, and West Africa. As a result, the only cruiser on the South Atlantic Station had to be sent hurriedly to bolster the one-cruiser squadron on the American and West Indies Station, and a cruiser had to be detached from the East Indies squadron of only two cruisers to serve on the South Atlantic Station.

When the Yangtze incidents caught us unawares, the cruiser *Jamaica*, which had just arrived in the West Indies to make up our deficiencies on that station, was sent to strengthen the Far East Station. And when the few cruisers in the Korean theater proved to be insufficient to meet the commitments of the Commonwealth naval forces, the cruiser *Ceylon*, which had just arrived on the East Indies Station, was diverted to Korean waters.

Each switch and reinforcement of one station reduced another station to a single cruiser, or none at all, and laid it open with nothing to meet a sudden emergency.

Excluding the old cruisers *Devonshire*, used as a training ship, and *Cumberland*, to be employed as a trials vessel, we now have only 24 cruisers in the Royal Navy, of which only 11 are active, the remainder being in reserve or refitting. Before the war, we had 63 cruisers, of

which 30 were operational. These included six in the Home Fleet (2); six in the Mediterranean (3); five in the Far East (2); five on the American and West Indies Station (1); three in the East Indies (2); and one in the South Atlantic (1). (Figures in parentheses indicate present strengths.)

Present Position

The Royal Navy today comprises 13 aircraft carriers, 5 battleships, 24 cruisers, 104 destroyers, 162 frigates, 2 monitors, 3 fast minelayers, 56 submarines, and 60 minesweepers. This strength is not equal to what we could expect to lose in war.

Fortunately, the United States Navy consists of 4,660 vessels, including 102 aircraft carriers, 15 battleships, 71 cruisers, 351 destroyers, 271 escort destroyers and frigates, 187 submarines, 217 minesweepers and minelayers, 176 patrol vessels, 945 amphibious craft, 553 auxiliaries, and 1,772 service craft.

Under the Mutual Defense Assistance Program, the United States is supplying the countries of Europe with surplus destroyers and frigates (not included in the totals above) so that fortunately these ships, the counterparts of which in Britain have been scrapped, are available in the common pool of Western Union defense.

Soviet Military Air Training

A Program With a Purpose

Digested by the MILITARY REVIEW from an article in "Aviation Age" (United States) July 1951.

THE large manpower reservoir from which the Soviets have to draw upon for likely Air Force personnel is carefully filtered, so to speak, at its very source. At the age of 17, the youth who has completed satisfactorily the primary DOSAV (All-Union Society of Voluntary Assistance to Aviation) flight course is eligible for the Air Force entrance examinations, with certain provisions. He must have had 7 years of elementary education if he wants to be a pilot. This is the Soviet equivalent of United States high school preparation. If the candidate is older and desires to become a navigator or bombadier, he must have had 10 years education, or the equivalent of 3 years of college in the United States.

Examinations

The youth takes his three-phase examination at the DOSAV headquarters nearest his place of residence. He undergoes a thorough physical examination. This is followed by a scholastic test in which mathematics is emphasized. Then comes the political test which determines whether or not the youth is worthy of handling the State's aircraft. This is given by MVD officials. The "democracy" of which the Kremlin is wont to boast in its propaganda is revealed in all its sham by the political prerequisites of the test. The Air Force candidate can be eliminated immediately, at this point, *if either his parents or grandparents erred even slightly from the Party line.* If the boy's forebearers were *kulaks* or land-owning people, bourgeois middle class, officials or even members of any church, or if they were counterrevolutionary, he is disqualified. If he has sufficient DOSAV flying time, he may be permitted to go to one of the *Aeroflot* schools. If the youth can survive this political screening, he is sent to one of the Air Force's flying schools.

Training

The selectee goes through a period of basic training which is much the same as that given to Army trainees. Then his flying begins with a critical "primary review" period in the *UT-2*. This phase reveals to his instructors how well he retained his DOSAV training. If the selectee is too sloppy or otherwise lacking in aptitude, he is washed out during this 25-hour period. In this event, he can, at best, become a bombadier or navigator if he has sufficient education, or he may be sent to the civil airline school. At worst, he may be sent to one of the schools which train ground crewmen.

Basic Training

The selectee progresses to the basic flying state in which he flies *La-7*, *Yak-7*, or *Yak-18* trainers for a period of about 45 hours. During this phase, the youth also gets some instrument training in the American Link or British Bachelor trainers which are built under license in the USSR. The amount of instrument time appears to vary with the particular school.

At the beginning of the advanced phase, the selectee is permitted to state his preference for fighters or multiengine craft. Normally, he is assigned to the branch of his choice, if he has demonstrated the proper aptitude during basic training. The Soviets are following the American practice, to some extent, of assigning the younger men to fighters and the older, more stable candidates to the bombers. These assignments are made by a school selection board, one member of which is the ever present *Smersh* representative. From this point on, youths who show special aptitude can be "promoted" out of the course and sent to various instructor's schools.

Advanced Training

Between 25 and 30 hours are given to advanced training in obsolete single- or twin-engine wartime aircraft. The favorites for this stage of training are the American *P-39* and *B-25;* but the more numerous *MiG-3*, *La-3*, *La-5*, *La-9* and *La-11* models are widely used. Some *Pe-2* and *Pe-3* types are used, along with *PS-84s*, *Tu-2s*, *Yer-4s*, and *Il-4s*, for bomber aircrew training. This advanced stage ranges from 65 to 100 hours and includes gunnery and a growing emphasis on formation flying. The Soviet instructors prefer live ammunition to synthetic gunnery devices of any kind. Both ground and towed sleeve targets are used for aerial shooting, while considerable small arms practice is given on the ground. One popular gimmick is a kind of skeet shooting with a small-caliber rifle at a target larger than the United States "bird."

The pilot-trainee takes a final examination in not only his flying but the political courses given under the auspices of the Local Young Communist League. Then, as a junior lieutenant, he is assigned to a fighter or bomber squadron for operational training.

Readying for Combat

He is made combat-ready at this squadron stage. The youth flies wing on the veteran in fighter units or spends considerable time as copilot in the bomber squadrons. The training officer, who is usually the deputy squadron leader, keeps a weather eye on all his rookies. He personally is responsible for them, and can be removed if too many of his charges fail to demonstrate the proper progress and aptitude.

Squadrons are kept intact whenever possible, and the "growth of the family" is encouraged for purposes of morale and *esprit de corps*. Pilots seldom are promoted out of the squadron. The practice is to deactivate the complete outfit and re-establish the unit at some other point. In the fighter units, jet training reportedly is given at squadron level in the two-seater *Yak-15C*, which is known to be in large-scale production.

Ground Crews

Ground personnel are selected at DOSAV level. Mechanics serve a sort of apprenticeship right in the aircraft plants before they are assigned to operational outfits. Many institute scholarships are available for promising mechanics. In the bomber squadrons, both mechanics and gunners get sufficient flying time to at least "solo" the aircraft. The ground crews show great enthusiasm and take considerable pride in their work as part of the team.

Soviet Air Force students receiving instruction in the operation of a sextant.

Several schools of higher education are playing an important part in the preparation of future officers. The Moscow Aviation Institute is the most prominent for tactical instruction. The Soviet Air Force War Academy has branches in Moscow, Sverdlovsk, and Chkalov. The Air Force Medical School also is located near Moscow. There is a Motor Transport School at Magnitogorsk, a Political Warfare School at Zaratov, and a Chemical Warfare School near Tashkent. Others include the Kuibyshev Military Engineering Academy, Kharkov Aviation Institute, and the well-known Zhukovski Air Engineering Academy or VVA for the training of designers and engineers. A smaller institute for aero designers is the highly regarded MAI.

Engineering

During World War II, a serious kink in Soviet training became apparent. The top-level engineering people were first rate. However, these personnel lacked depth. At the junior and shop levels, the engineers and technicians were too few and too limited in training and talent. The rapid expansion of the older schools and the establishment of new postwar institutions indicate the Soviet's determination to correct this shortcoming.

Insofar as flight training is concerned, its very scope and activity in all parts of the USSR upsets the hope that the Soviets might have been too short on oil for the high-gear training program required to keep pace with their large-scale production of military aircraft.

National airmindedness is a vital element of air power. In this, the Soviets boast a tremendous potential. "Sports flying," as they call it, is practiced on a scale exceeding that of private flying in any other country. Aviation, *per se*, has been propagandized to the point where Tupolev or Kozhedub are as familiar to elementary school pupils as are Washington and Lincoln to American school children. Aviation Day is as big an occasion in the USSR as is Memorial Day in the United States.

Air Conditioning

The Soviets have capitalized cleverly on the natural fascination aviation holds for the youth. Every high school has its aero club. Each Young Pioneer Club holds classes on model building. Youths who demonstrate an aptitude for some phase of aeronautics—as well as the promise of becoming an "active-participant in socialist construction"—are given physical examinations and enrolled into one of the DOSAV clubs.

Recruits in the DOSAV receive their training free of cost; but they earn their wings through rigid application and study during evenings and weekends. This is

the postwar organization which succeeded the well-known *Osoaviakhim*, whose training activities date back to 1927. The society was responsible also for the disciplined civil defense organization to which many observers credited the low casualty rates during the wartime raids on the larger cities. In addition to these "air raid precautions," today's DOSAV members devote approximately a year to the study of the conventional ground school subjects such as aerodynamics, power plants, construction, navigation, and parachutes. Considerable political indoctrination is included in this course. To break the monotony, students are permitted to make parachute jumps from the 'chute towers that abound in the public parks, trade union recreation grounds, and rural centers. There are reported to be about 1,100 of these parachuting towers under DOSAV supervision. The students' completion of a satisfactory examination is rewarded by primary and advanced glider training.

Air Training

The most promising glider pilots are permitted to begin flight training in primary *Po-2* biplane trainers. They receive approximately 30 hours dual and 20 hours of closely supervised solo time in this plane and the *Yak-11* monoplane. During this period, they also make one or two parachute jumps from aircraft. If they evidence the stomach for serious parachuting, the recruits can gain some measure of local fame by going over the side at least 50 times to win a "master jumper" badge. (As of May 1950, there were 387 master jumpers registered with the Central Aero Club. Most of these had more than 150 jumps to their credit, and 5 are claimed to have made 1,000 descents from aircraft.) It is believed that some advanced training is afforded the DOSAV pilots in the growing number of *Yak-18* trainers, and several of the clubs in the larger cities are known to have available obsolete tactical craft such as the twin-engine *SB-2*.

Early in 1949, there were some 400 of these DOSAV "cells" throughout the USSR. This is made more impressive by the fact that, in 1935, the *Osoaviakhim* had in operation only 135 flying clubs. Although the purpose of the society is the procurement of air personnel of all kinds, the Soviet Air Force looks to DOSAV for its reserve of pilots. Before the war, the most talented *Osoaviakhim* graduates went to the larger training centers to receive their advanced air force instruction. However, under wartime pressure, many of the larger flying clubs became themselves the basic training schools of the Soviet Air Force.

The Soviets have capitalized on starting youngsters on careers as Air Force pilots.

DOSAV's Program

Although emphasis is laid on flying, the society encourages efforts in other directions. Annual competitions for the design of trainers or sports planes are contested

keenly for prizes as high as 40,000 rubles. Between 900,000 and 1 million youths between the ages of 14 and 18 are conscripted annually for industrial training. After the on-the-job training period is completed, conscripts serve the Government for a 4-year period. DOSAV experience enables the youths, many of whom are young women, entering the aircraft industry to complete their training more quickly. And it reportedly entitles the conscripts to special privileges throughout their working periods.

Equally important, the organization is the greatest source of ground personnel for both the Air Force and civil air fleet. To a lesser degree, DOSFLOT (All-Union Society for Assistance to the Naval Fleet) is a source of personnel for the naval air arm and industry.

Political Indoctrination

This factor alone makes the organizations well worth their large subsidies. However, DOSAV and DOSFLOT are of value to the Government in still other ways. They are the largest agencies for arousing national airmindedness in all age brackets. The societies impart to a large portion of the population a considerable amount of technical knowledge. And, through these organizations, political indoctrination is accomplished painlessly. The instructors cleverly mix a little Lenin with landing gears and add a touch of Marx to their discourses on Mach numbers. The youths—who secretly may not give a darn, but just want ever so much to fly or be around airplanes—are inculcated thoroughly before they realize what it is all about.

Communist imperialism attacks and undermines national independence and international co-operation. In their place it substitutes a rule of force. Communist imperialism also seeks to destroy the system of government that serves the welfare of the people. Instead it sets up a system under which the people exist only to serve the purposes of the Government. As a result the Soviet system is one of unbridled power, imposing slavery at home and aggression abroad.

President Harry S. Truman

The Application of the Principles of War to Air Power

Digested by the MILITARY REVIEW from an article by Group Captain W. D. Disbrey in "The Journal of the United Service Institution of India" July-October 1950.

This is the second of a series of two articles on this subject. The first article appeared in the October issue.—The Editor.

Co-operation

THE complications of modern warfare have brought about the need for more and more specialization. This has made it more difficult for the services, and the specialized branches within the services, to understand each other's capabilities, problems, and requirements. Difficulties brought about by this state of affairs can be overcome only by good co-operation and liaison. Modern fighting services and the various branches within the services are so dependent upon one another that full and continual co-operation is the only way to achieve efficient and economical results.

Co-operation Within the Services

Co-operation within a service is most important. Once this deteriorates, there is no way of knowing where it will end, as the detrimental results are cumulative and have the effect of splitting the service into separate watertight compartments, resulting in a lack of efficiency. In particular, co-operation within a headquarters is of prime importance now that the various branches are becoming more and more specialized. Unless perfect co-operation is maintained between all branches at all times, they will not be in the picture and the headquarters will not operate smoothly and efficiently.

Co-operation Between Services

All modern warfare depends upon combined operations, and each service is nearly always dependent for its success upon the support of one or both of the other two services. Unless good co-operation is maintained between services from the lowest level, adequate support cannot be given. It is essential for every man, officer, formation, and headquarters to understand thoroughly, within their terms of reference, the capabilities and the responsibilities of the other services. It is the duty of an air force to see that the knowledge required to ensure this co-operation between services is provided by the suitable training of the officers and men.

Co-operation Between Allies

When allies are fighting together, co-operation is most important, especially between similar services; otherwise considerable wasted effort will occur. Such co-operation can be divided into two classes, operational co-operation and material co-operation. Operational co-operation must begin at the highest level; each air force must be given a definite task so that the two air forces, which in all probability will have different characteristics, can be used to the best advantage without overlapping or duplicating effort. Due allowance always must be made for the different temperaments and characteristics of allied personnel. If not, differences of opinion will occur, and good co-operation will not be achieved. Material co-operation covers the development, production, and the supply of various war materials essential for the war effort. Great advantage can be obtained over the enemy by pooling such resources so that the best equipment and the maximum production can be obtained.

Co-operation Between the Services and the Civilian Organizations

Co-operation between the services and the civilian industrial and development

organizations is vital in modern warfare, because otherwise it is impossible to obtain the best results from the technical resources at the disposal of a nation. The industrial and development organizations have their limitations, and, unless they are understood thoroughly by the air forces, difficulties will arise which will have only the effect of delaying the introduction of some new, and possibly vital, item of equipment. The converse, of course, also applies, because it is just as important for the industrial and development organizations to know the limitations of the services. Both sides must keep one another fully in the picture; otherwise the best and speediest results will not be obtained.

To ensure that all forms of co-operation are appreciated and exploited fully is a responsibility which must receive high priority in an air force, both in war and in peace. In general, it is basically a training commitment, but one of the best means of spreading a spirit of co-operation throughout a service and between services is by the example of senior officers.

Surprise

Surprise offers such enormous advantages that it always must be in the forefront of a commander's or staff officer's mind. By its aid, morale and material effect can be obtained out of all proportion to the amount of effort expended. By its use, a superior enemy can be defeated or put at a serious disadvantage. Air forces provide a wide scope for obtaining surprise, because aircraft are able to move in three dimensions, are independent of supply lines in the actual battle area, and, within limits, are independent of geographical or topographical features. For these reasons, air forces are able to achieve surprise much more easily than sea or land forces. However, it must be remembered that the enemy has equal knowledge of the surprise that can be obtained by an air force, and he will make certain that he is prepared adequately, if he has the necessary resources available.

The possibility of using surprise in an air force occurs so frequently, and the advantages that can be obtained by the use of surprise are so important, that each class of surprise will be discussed separately.

Tactical Surprise

Tactical surprise can be achieved by improving the methods of operating aircraft against either air or ground targets. However, care must be exercised in introducing new tactical methods, because unless secrecy is maintained, and the methods are developed fully and tested before being put into use, the full benefit of surprise will be lost. Good intelligence can be of great value in implementing tactical surprise. It is by this means that the latest moves of the enemy can be obtained, and attacks made and where he is least expecting them. Tactical surprise in the air can be achieved only by having good and efficient formation leaders, and a good and efficient planning staff on the ground. Both must be in close touch with the intelligence organization.

Strategical Surprise

An air force can obtain strategical surprise which is impossible for the other services to obtain, since the striking power of the air forces can be switched from one target to another at very short notice. If the preparations for such strategical concentrations are screened carefully during the build-up, and are completed before the enemy has time to take countermeasures, it may be possible to throw him off balance and to deliver a blow from which he may find it impossible to recover. Surprise by strategical reinforcement can be obtained only by long-range planning.

Unless well supplied and equipped bases are provided beforehand, the enemy will be able to forecast the intention when he sees a movement taking place which is an obvious build-up for a special operation.

Organizational Surprise

Organizational surprise always should be borne in mind, especially during peacetime, because it is only by good organization that a force can be controlled efficiently, can achieve satisfactory flexibility, and, at the same time, make the most economical use of its manpower and equipment. An efficient organization always is required for mobilization and expansion. It is the only means by which a large and effective air force can be formed in a short period of time on the outbreak of war, with which it might be possible to interfere with the initial plans of the enemy and put him at a disadvantage at an early stage.

Development and Production Surprise

Technical development has the capacity for producing the greatest surprise of all. It is incumbent upon a nation to keep itself up-to-date in the technical development of air weapons, and the aim should be to keep ahead of any potential enemies. The initial blows that now can be delivered from the air are so powerful that if new weapons are used, for which there is no antidote, it may be impossible for a nation to recover from the initial attack. Closely allied with development is production, for it is of no use having the best type of weapons in the world if enough of them cannot be produced in the time available. Therefore, it is necessary to plan for an industrial organization in peacetime which will be capable of changing over to war production at very short notice. The ability to produce war equipment and supplies rapidly might well surprise the enemy and be a war-winning factor. The speed of technical development in the equipment of modern air forces has increased the possibilities of surprise being obtained. However, it must be remembered that nearly all modern developments have an application in the reverse direction, which, if handled properly, can reduce the effectiveness of the new weapons. In the majority of cases, it will be found that when two nations go to war, their relative development of air weapons is about equal. It will be the training, the efficiency of the organization operating the weapons, and the capacity for further development and production which will count in the end.

The final maxim to remember when applying the principle of surprise to air forces is that after surprise has been achieved, full use must be made of its effect upon the enemy. He must not be allowed to recover from the initial shock, and it is essential for the follow-up action to be included in the original plan; otherwise the job will be only half completed.

Security

Air forces have a great responsibility in providing for the security of the fighting services and the civilian organization of a nation. The protection of the civilian organization is most important, because a nation is dependent on its total resources being available to fight the war. If the industrial organization is interfered with by enemy air attacks, the striking power of the fighting services will be reduced. Security starts with a secure base, is followed by having secure lines of communications, and ends with the security for the fighting services. It is the vital task of the air forces to provide this security from the air attack of the enemy.

The characteristics of the air forces enable them to provide certain security measures for a nation that cannot be provided by the other two services. These measures can be divided into the following groups:

1. Air defense of the civilian organization and the fighting services.

2. Tactical and strategical reconnaissance necessary to forecast the moves of the enemy.

As soon as war is declared, the most important task of an air force is to ensure that the main base or bases, from which the war will be conducted, are secure from air attack. In this connection, it must be realized that there will be no time in which to build up to provide this security. The defense must be ready and waiting from the beginning. Defense of this nature can be carried out by two methods, either by intercepting the enemy's air weapons and diverting or destroying them before they reach their targets or, if the range and conditions are suitable, by carrying out offensive attacks upon the enemy's airfields, offensive bases, or launching sites to prevent or reduce the number of attacks being made.

True security can be obtained only by gaining accurate and continuous information of the enemy and his intentions, and it is only by this means that it is possible to decide upon the amount of effort to allot to the defense, which, in order to provide the maximum offensive force, must be kept to a minimum. Air reconnaissance is the most effective method of obtaining information concerning the enemy's intentions, and air forces must ensure that adequate reconnaissance forces are available at the beginning of operations. The importance of this requirement is such that the best and latest equipment must be provided for the reconnaissance force.

Security of the air forces themselves must not be forgotten. In the past, it always has been the policy to regard the dispersal of airfields and aircraft as the best means of providing security against air attack, but this is not always true. There is a great danger of taking the principle of dispersion too far, with a resultant loss in operational efficiency. The degree of dispersal for aircraft always must be a compromise between operational and security requirements, and will depend upon the conditions prevailing at the time. As far as air bases are concerned, it often is better to concentrate them as much as possible to give them the maximum protection by the close grouping of antiaircraft and fighter defenses.

Finally, when dealing with this principle, it must be remembered that security is not entirely a defensive measure; offensive attacks upon enemy airfields and reconnaissance over enemy territory are equally important. All commanders and staff officers of an air force should be trained to appreciate that it is only a reasonable defense that is required, since all possible effort must be put into the offensive which alone can achieve final victory. Overinsurance in defense will be a millstone round the neck of a nation at war.

Economy of Force

This is a general principle which applies to all three services in much the same way; it has very little that is peculiar to air forces alone. Modern war requires the total resources of a nation to be used to keep the fighting forces going. Therefore, it is fundamental that wastage of manpower or materials cannot be allowed. There are two main headings under which this principle can be studied in its detailed application to air forces; they are operational and administrative economy.

Operationally, commanders and staff officers must economize to the maximum degree in the use of air forces. Their planning must ensure that the minimum force is issued to do a particular job properly; overinsurance will result only in the loss of striking power on other targets. Final victory can be won only by offensive action, and, to enable the maximum offensive to be maintained, a continuous review must be made of the forces tied up in the defensive to ensure that all possible

effort is released to the offensive as soon as it can be spared.

Operational planning staffs, at all levels, always should ensure that the most economical type of force is allocated to any particular target or operation and that the correct balance of the various types of aircraft is employed. It often will be found that, when operating with the other services, many requests will be received for air support that are very minor in importance when reviewed in the light of the over-all air plan. Such requests must be examined carefully, and rejected if necessary, because, if they are accepted indiscriminately, the air resources will be split into "penny packets" which will result in inefficiency and prevent the use of large forces for more important operations.

Efficient administration and organization within an air force is instrumental in bringing about true economy, especially in peacetime. It is only by the employment of the most efficient methods that the best use can be made of the resources available in manpower and equipment. With the rapid strides that are being made in the development of air force equipment, careful planning is required to ensure that the correct training of aircrew and ground personnel is carried out. The equipment ordered should be as little specialized as possible, and should be capable of covering a number of stages of development. Such planning will need relatively large and highly specialized staffs, but the resulting dividends will ensure an over-all economy.

Economy of force must be the watchword of an air force, both in peace and in war. In peace, financial restrictions will never enable an air force to have all that it requires. Therefore, it will only be possible to create an efficient air force by making the most economical use of the resources available. In war, a nation has to make use of all resources, and rarely has sufficient for its purposes. Therefore, to bring about the defeat of the enemy as soon as possible, it is essential that the most economical use is made of the forces available.

Conclusion

The principles of war are familiar to most staff officers and commanders, but normally they only deal with them in broad terms relative to the fighting services of a nation as a whole, and there is a tendency to forget about their special application to air forces. It is, however, most important that full consideration always is given to the special application that some of the principles have to air forces, because otherwise their maximum striking power will not be realized.

The principles of maintenance of the aim, economy of force, co-operation, and, to a certain extent, security are very similar in their application to all three services. On the other hand, the principles of the offensive, surprise, mobility, and concentration have very special application to air forces. They are closely related and dependent upon one another, and it is only by obtaining the correct balance for any particular operation that the greatest effort can be made.

The study of the principles of war and their application to air forces eventually leads to the overriding importance of training. Unless staff officers and commanders receive adequate training, not only in the application of the principles themselves, but also in the careful and logical reasoning required for their detailed implementation, the principles never will be applied properly, with the result that the air forces will suffer from misdirection and inefficient control. In peacetime, the training of staff officers and commanders, in this respect, should receive high priority, because no nation can afford to keep a full-scale air force-in-being. A high standard of training must be concentrated upon to provide a suitable nucleus around which to build a full-scale

air force on the outbreak of hostilities.

Finally, it should be remembered that the principles of war are only a guide and are not definite rules and regulations that must be obeyed. They must, however, be taken into consideration, and their implications weighed before any operation is undertaken. It is only by such methods that it will be possible to arrive at the correct and firm policy.

Aviation in the Soviet Union

Digested by the MILITARY REVIEW from an article by F. G. Swanborough in "The Aeroplane" (Great Britain) 9 March 1951.

IN World War II, the Soviet Air Force put considerable emphasis on the construction of fighters and light and medium bombers for tactical troop support, to the almost complete exclusion of heavy bombers suitable for operation in a strategic role. The fighters produced, up to the end of 1945, were characterized by their light construction and their consequent low wing loading and good maneuverability.

They were not as fast as contemporary Western types. The advent of the jet engine appears to have enabled Soviet designers to rectify this failing, however, and the quest now seems to be for high speed.

A study of one of the latest Soviet jet fighters, the *MiG-15*, suggests that speeds of up to 640 miles an hour might be achieved. This performance, which has been obtained by the use of swept-back wing and tail surfaces, is combined with a high rate of climb and good maneuverability, achieved by keeping the weight and wing-loading down to a minimum.

Bomber Development

Tactical support bombers still receive much attention in the Soviet Air Force. In addition to an up-to-date version of the *Stormovick*, at least one type of twin-jet bomber has been developed for use in this role, and is coming into service.

In any future war, however, the Soviet Union would be handicapped severely without a strategic bomber force, and such a force apparently is now being built up. As standard equipment, the "pirated" version of the Boeing *Superfortress* is said to be in large-scale production, and seems likely to remain so at present.

The performance of this type can safely be assumed to be similar to that of the *B-29*, and, as a result, its operational radius is not likely to exceed 2,000 miles. Having regard to the distance between Soviet bases and key targets in the West, this range is insufficient, and it is more than likely that a long-range, heavy, piston-engine bomber is under development in the USSR at the present time.

Soviet Transport Aircraft

Transport aircraft always have figured prominently in Soviet Air Force equipment, and there is certainly a close integration of the military and civil transport authorities. One reason for the importance of transport aircraft is the priority given to paratroops in the Soviet Union. The vast distances involved in moving about the country also call for large numbers of aircraft. Thus, it is all the more surprising to find that the first adequate transport aircraft to go into service was the Douglas *Dakota*, which was built under licence in the Soviet Union and also was supplied under lend-lease arrangements. Although the Soviet-designed *Il-12* is coming increasingly into service for both civil and military use, the *Dakota* also remains in large-scale use.

At least two types of four-engine trans-

port planes have been built by the Soviets since the end of the war, but there is no real evidence that they are being used in any numbers. It may well be that the majority of airfields in the USSR do not have runways suitable for such aircraft, and this factor may be impeding the development of aircraft in a category which otherwise would be of considerable importance.

Training Planes

Training aircraft have, until recently, tended to be somewhat ancient in appearance, but the latest types of primary and advanced trainers appear to be in the same class as their Western counterparts. Two-seat conversions of piston-engine and jet fighters also are in service.

The Soviet Union has a considerable background of rotary-wing aircraft experience, but this does not appear to have been exploited to the full in the past 10 years. Prototypes of a twin-engine, multiseat helicopter have been flown, and there also is a single-seat light helicopter, which might be useful for operation from submarines. However, there is no evidence that helicopters are being used in military service.

Gliders, on the other hand, continue to receive much attention for use with airborne troops. At least two types of large troop-carrying gliders in the *Hamilcar* class are in service at the present time.

Most of the aircraft of which details are known outside the Soviet Union can be attributed to one or other of a small group of leading airframe designers. The aircraft designed by these engineers now carry designations which include an indication of the designer's name—a system which may seem strange in a state where individuality is frowned upon.

Engine Development

The development of engines in the Soviet Union, up to the coming of jet propulsion, probably lagged behind airframe design—and well-designed airframes almost certainly suffered from lack of adequate power plants. This situation now has largely been overcome.

Initially, the Soviets lagged seriously in jet development, and by the end of the war had made no real progress, with the possible exception of rocket motors, which always have received some attention in the USSR. After the war, the Soviets, therefore, were only too ready to take over all the German jet work—including aircraft, engines, designs, and technicians—they could lay their hands upon.

Present Soviet jet engine development, therefore, mostly rests upon this foundation of German work.

Rocket engines have received considerable attention, and again German work must have proved useful. Lavochkin piston-engine fighters have been seen with rocket units under the wings or in the rear fuselage, and persistent reports indicate the Soviet development of an all-rocket fighter derived from the *Junkers 8-263*—itself a development of the *Me-163*.

Aircraft Production

Construction of all aircraft and aircraft engines is, of course, under state control and is undertaken at the various state factories. Most of these are located in Western or European Russia—a fact which nearly proved disastrous for the USSR when invaded by Germany in 1942. Aircraft production then was saved only by the wholesale uprooting of the factories and their transfer—lock, stock, and barrel—to the East.

Although this gave immunity from air attack, it introduced labor and supply problems, and consequently most of the factories moved back when the German threat abated. They are now again within reach of air attack from Western Europe; but the fact that these factories can be moved with comparatively little effect on output is significant.

Research facilities in the USSR appear to be good but limited; again, they have undoubtedly benefited from captured German equipment and engineers.

There is little evidence to suggest that the Soviet Union has matched the West in the past few years in the extensive development of equipment to meet the specialized needs of high-speed, high-altitude flight.

Armament

In the field of armament, we have more information. The Soviet Union always has shown herself to be particularly able in the design and production of guns of all types, and aircraft cannon have proved no exception.

Recently, emphasis has been placed on the development of larger caliber guns, and 30-mm and 53-mm cannon are in service as standard equipment. This policy of using heavy-caliber guns for fighter armament is in marked contrast to British and American practice, where the 20-mm and .5-inch guns, respectively, are standard on all fighters up to the present day.

Rocket armament received early attention in the Soviet Union, and was in use for air-to-ground work before being developed by the allies during the war. Parallel German work no doubt has led to considerable advances being made in this field.

Evidence that ejector seats have reached a fairly advanced stage came in 1948 with photographs of a seat being fired experimentally from a modified *Pe-2*. Ejector seats now are standard equipment on the latest jet fighters, such as the *MiG-15* and that of Lavochkin design.

Radar and Radio

Up to the end of the war, the Soviets had made little advance with the development of radar. Despite the German work and equipment now available, there is little evidence that a chain of early warning radar stations has been established. The Soviet Union's "buffer" of satellite states across Eastern Europe would be a tangible asset in this respect, but such early warning radar stations as are known to exist are widely separated, with no overlap, and are not located in the satellites. The "chain" runs from the Baltic to the Black Sea through the Ukraine.

Her late start in the field of radar almost certainly leaves the Soviet Union behind Britain and the United States, and this is likely to be true of radar bomb sights and airborne interception radar for night fighters. German airborne interception even at the end of the war was clumsy and inefficient, and it is perhaps significant that no Soviet aircraft seen so far show any signs of carrying radar, nor are any specific night fighters, piston-engine or jet, known to be in service.

A study of photographs of the latest jet fighters reveals only medium frequency radio aerials, and it can safely be assumed that very high frequency is not currently in use. Ground control of fighter interception probably is nonexistent, chiefly because of the lack of adequate communications facilities.

Of the Soviet Union's ability to reach a high standard of production little can be said. No expense is likely to be spared in an attempt to achieve high quality; but, on the other hand, the larger the industry—and the Soviet Union's probably is the largest in the world—the lower must be the average standard of skill of the workers therein. Such inspection of recent Soviet aircraft as has been possible tends to confirm the impression that the standard of workmanship is not high.

Although there is ample evidence that the Soviet Union ranks among the first three great powers in the matter of air craft design, this question of production ability—judged qualitatively, not quantitatively—seems likely to remain problematical for some time to come.

Reflections on Defense

Translated and digested by the MILITARY REVIEW from an article by Lieutenant Colonel Cordaillat in "Revue Militaire d'Information" (France) 10 May 1951.

DEFENSE, according to Clausewitz, is the strongest form of warfare. However, it would seem that it is a minor art, for it supposes the abandonment of all or part of a force's freedom of action, the submission to the will of the enemy, and the reduction of maneuver to counterattacks.

When static, it leads, inescapably, to defeat, unless it has counterpart offensive action.

When dynamic, it can hope to last only at the cost of attrition, which is more costly than offensive action.

Generalized, it is not only condemnable, but has a disasterous influence on morale. It is the mark of a decadent nation, and its advocacy in doctrine is the admittance of impotence.

Nevertheless, the defense is a necessity.

Whether we are forced into a defensive situation in order to achieve economy of force which will permit decisive offensive actions elsewhere, or whether we are on the defensive in a given theater of operations awaiting the arrival of allied reinforcements or covering a build-up of forces, the defense should be organized to ensure continuity and co-ordination of action both in width and in depth and provide for an economy of force.

There may be times when we will be forced into a defensive situation and we have neither the manpower nor the equipment to organize the defense according to the concept mentioned above. When such a situation exists, the defense is forced to hold on a broad front. However, the reconciliation of two such contrary terms—"hold" and "broad front"—is possible only in one's imagination.

We owe it to ourselves, therefore, to ponder over this problem, which is much more difficult than any similar problem presented by offensive action. In order to examine the given factors in this problem, we shall proceed from the simple to the difficult, and from the normal to the broad fronts.

Defense on a Normal Front

We regard a front of from 6½ to 8 miles as normal for defense by an infantry division.

It is agreed that the tactical unit is the battalion, and that this size unit, even when reinforced with antitank and antiaircraft means, is unable to cover an area of more than 250 acres, operating as a center of resistance.

If we were obliged to give continuity and depth to our position, our nine battalions would not suffice, and each of these nine centers of resistance could hope to resist no more than a few hours in case of a powerful attack.

Normally, the defense disposition of the division would comprise two subsectors of four or five battalion centers of resistance; subsector reserves of two or three battalions, including the direct support artillery; and a divisional reserve of one or two battalions.

The divisional commander, having insufficient reserves at his disposal (in the event of a deep penetration), could just as well, after having committed his units and established his fire plan, retire to his tent and let the gods take over.

What is to be done when the subsector reserves are absorbed with a break-through of the front and the divisional reserve is without force or effect against a powerful attack? Also, is not the committing of a subsector reserve battalion into a counterattack equivalent to forcing it to

abandon an organized position and placing it just anywhere?

In short, is not the presence of subsector reserves, whose action is not coordinated by the division, equal to a splitting up of forces? As a matter of fact, the division will have fought in three successive phases.

Possibility of Maneuver Required

What is needed by this unhappy division commander, smitten with orthodoxy? He needs the *possibility of maneuver*, that is to say, a mass of maneuver and its freedom of action.

In other words, he should not consider first what is necessary for equipping his sector—infantry and fire power—and then place in his reserve what forces remain. Rather, he should first make up a mass of maneuver on the basis of the possibilities of attack, and then cover it with what remains.

This mass of maneuver, in the case considered, will comprise, as a minimum, a grouping of three infantry battalions, reinforced with armor and sufficient artillery, able to act effectively against the enemy's flank in the most dangerous part of the sector. A second group of one or two infantry battalions, reinforced with tank destroyers and artillery, must be able to act effectively against the enemy's flank in other areas of the sector, or to assist the operations of the principal grouping by blocking or channeling the enemy's advance.

The artillery of the mass of maneuver is that of the division. Its mission will be, at the same time, *defensive* for the benefit of the covering centers of resistance, and *offensive* for the benefit of the mass of maneuver.

Obtaining Information

Freedom of action rests on the basis of information—that is, *exploitable* information. Such information can be furnished only by *strong centers of resistance* holding the principal terrain points which the enemy cannot miss in his advance, which, because of their resistance, will force the enemy to reveal his intentions.

These strong centers of resistance will be held by the remainder of the battalions, other than those in the mass of maneuver—possibly four or five—which will be sacrificed, perhaps, but which will transmit information until they are destroyed or captured. These battalions will operate in a purely defensive manner, but they must possess, organically, an increased allotment of antitank weapons, mines, and mine laying equipment.

In the hypothetical case considered, the infiltration corridors should be of a maximum width (½ to 1¼ miles) so that the enemy must attack in force, in order to reduce one or two centers of resistance. Such an operation will delay the enemy from 3 to 4 hours and will permit effective intervention by the mass of maneuver.

In such a system, there no longer would be any subsector, subsector reserve, or direct support artillery assigned to a subsector. Instead, there would be a *covering echelon*, under the orders of a single chief, with the mission of holding and reporting information, and a mass of maneuver divided into one or two groupings, including all the artillery, whose mission would be, at the same time, defensive and offensive action.

This system would permit the division, with adequate information about the enemy and with sufficient combat means, to act in an integrated manner against the flanks of the enemy's attack, at a time chosen by the division commander. However, the division's task would not be much easier, because, by definition, the enemy would be in an attacking position and, therefore, have superiority of means. Nevertheless, by having a limited zone of action, air support for a relatively short period of time, and the factor of surprise,

the division would be able to unleash an effective counterattack and then re-establish itself in its previous positions, which it would still hold.

In such a case, it is the best method for conducting the battle.

Defense on an Extended Front

Extended fronts can be considered as fronts of from 9 to 19 miles, depending on the defensibility of the terrain, that is, terrain penetrable only with difficulty by tanks, in certain places. A defense installation in back of a natural obstacle is the classical example.

By virtue of the ancient principle that the weaker one is the more he needs reserves, we shall maintain the necessity of a mass of maneuver of the same size as the example cited in the previous situation. The problem then becomes more complex; it is mainly an antitank problem. We must remember that it was the mass employment of armored formations that brought victory to the Soviet Army over the *Wehrmacht*. We should be aware of the fact that the Soviets are producing some 65,000 tanks each year, and their most probable strategic employment would be a mass movement toward the coasts of Western and Scandinavian Europe, as well as the Eastern Mediterranean.

Without knowing the intentions of the Allied High Command, we willingly agree that strategic air forces will be able to create a radioactive desert from the Baltic to the Black Sea. Nonetheless, the present concept appears to be that there will be a sudden and massed attack on the defensive barrier.

It is along this barrier that our infantry divisions—under the most favorable hypothesis—will have fronts of about 19 miles. We must not expect any traditional, cautiously established contact with our positions. Rather, we must expect, after air and ground reconnaissance, an unleashing of armored forces under air cover, overrunning outposts and filtering between the centers of resistance as far as the zone of the reserves and heavy artillery.

Establishing the Defenses

Against such an onrush, the first method of defending is to establish a position behind a water obstacle, which can be set on fire by means of napalm bombs in order to destroy the enemy's crossing means. This procedure can be employed, no matter what may be the degree of enemy air cover. Such an idea is not idle imagination, for there are many possibilities in employing napalm.

The second portion of the defense, in point of time, consists of a surprise attack by troops using napalm barrages in the infiltration corridors 7 or 8 minutes (the normal time of combustion) before the counterattack by flame-thrower tanks and antitank troops. These troops make up the assault force of the mass of maneuver.

The intensive employment of nonmagnetic antitank mines and tank obstacles constitutes the third part of the defensive operations.

The covering centers of resistance, still reduced to four or five for each division, will hold the important terrain points on the principal axes of advance. The troops holding these terrain points must have a large number of antitank flame throwers allotted for their use, and they must be proficient in operating them.

In the hypothesis assumed, the period of time in which the enemy forces are detected and the division is warned will be very short; which, in turn, will allow very little time in which to maneuver.

However, the counterattack will be conducted systematically, with only short movements required, and with the infantry being used primarily as supporting troops for the tanks belonging to the mass of maneuver.

The air counterattack, which will precede the ground counterattack, must be launched by using a code word or code phrase, thereby permitting almost instantaneous action.

Thus, like a spider in the center of his web, the division commander then has his freedom of action limited only to the choice of the time for his counterattack. In addition, he is better informed, as a result of the information being sent back by the centers of resistance and the reconnaissance units, as to the strength and the routes of advance being used by the enemy.

Summarizing, it can be said that the defense should not be a question of outposts and subsectors, but of a reconnaissance echelon, a co-ordinated covering echelon, and a mass of maneuver.

The divisional artillery will be in the mass of maneuver, and the heavy mortar companies will be divided among the centers of resistance.

Defense on a Large Front

We have discussed the antonymy which exists between the two terms "hold" and "broad front." From the standpoint of a static defense, there is no such thing as a defense beyond 19 miles for each division.

In the case of a defense on a normal or extended front, information and the time necessary for the maneuvers are furnished by the covering forces. However, this solution cannot be employed on large fronts in the case of armored attacks.

Going back to the fortified castles of the past, we have the concept of powerful blocking forces on the principal axes of advance. Such a blocking force consists, in the main, of strongly entrenched infantry troops, as well as artillery and armored units. This force, capable of offensive action and short-range sorties, primarily would constitute a static strong point with the armored units doing the maneuvering.

It seems more judicious to us to assign zones to a reduced number of infantry battalions, all along the line of the enemy advance. This force then would be able to delay the advance of the enemy and give information and provide the time necessary to prepare a counterattack by the mass of maneuver.

In such a system—a combination of delaying action and counteroffensive, rather than maneuvering around fixed strong points—the division commander will be able to retain his freedom of action and control the time to start his counterattack.

Here again, the maximum of means must be allotted to the mass of maneuver, because the enemy should be halted by powerful surprise operations against his flanks, rather than attempting frontal action.

The essential thing is to break away from the old concepts of defense, which put static defense methods into practice.

It is primarily through offensive action that the defense will again become the strongest form of warfare. If this is done, Clausewitz will still be correct.

Logical Methods in Tank Development

Digested by the MILITARY REVIEW from an article by Lieutenant Colonel H. de J. Keays in the "British Army Journal" (Great Britain) July 1951.

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THERE has been much discussion recently on the virtues of various types of tanks, and much has been said on the question of their tactical employment. There is another important aspect which, so far, has been neglected. The writer is firmly convinced that the rate of development of tanks, shown by the various models produced over the last 12 years, is far too slow to secure an advantage over a potential enemy. A real advantage can be obtained only by boldness and originality of design, and, except in the detail of components, these are qualities our tanks have lacked since the idea of a track-laying fighting vehicle was first conceived by British engineers.

A Fresh Approach

The purpose of this article is to suggest a fresh approach to the fundamental problems of design, for, unless we revise our ideas of design very seriously, any discussions of employment are likely to lack realism, since they will be based on conceptions which may be outmoded already in potential enemy countries.

If we examine the old *Cruiser* and *I* tanks, the modern *Universal*, and, indeed, the tanks of all nations, we will find a broad similarity in their main dimensions. Sometimes there is emphasis on one feature, sometimes upon another, but always accompanied by an equivalent sacrifice elsewhere. When this emphasis is on armor, we have the so-called *I* tank; when it is on fire power, we have the gun tank. Much effort has been expended on the problem of increasing the armor protection within known reliable weight limits, and it now is clear that tanks in their present form offer little further scope for improvement. Although fairly good fighting space has been provided with the heavier weapons, the degree of armor protection possible is low, and the increases in armor that have been made secure little tactical advantage. The development of a heavily armored tank with high fire power has, therefore, become a basic design problem that cannot be solved on conventional lines by rearrangement and modification of existing types.

Fundamentally, the designer should seek symmetrical balance of the chief qualities of "fire power, mobility, and armor protection." Emphasis on any one of these qualities means degradation of the other two, and the good design always will be a compromise.

Factors Affecting Design

There are various external factors which influence design but which are outside the designer's control and must be accepted. Thus, over-all dimensions are limited by considerations of transport, and width of bridges. Obstacle crossing determines the shape fore and aft, and general ground conditions limit unit track pressure and so on.

Other factors are more subtle and not so readily appreciated. In days gone by, when tanks were simple, heavy track-laying vehicles, the designer's problem was easier and he embodied in his design components which were readily available. It was sensible for him to save weight where he could, for example, by the use of light radial aero engines. In recent times, the tank was studied more as a mechanism than as a specialist weapon of war. The dynamics of tank steering, propulsion,

and soil resistance were not understood properly and even now there is much basic research still to be done. At the beginning of the last war, tank design was a backward art, from the engineering point of view; and it is not surprising that attention was devoted far more to the mechanism than to the fighting qualities. The balance of designs was not good. In 1940, our best tank weapon was the 2-pounder and, in the case of the early *Churchills*, it needed nearly 40 tons of tank to carry it into battle. Even at that weight, the armor protection was not great. From the designer's point of view, at that time, the gun was the least important element; its installation appeared to present no serious difficulties. The problems such as the power plant and suspension seemed far more complex.

As design succeeded design, so more and more ingenuity was expended on the detail of components. The modern tank shows this ingenuity carried to the limit, and we have highly efficient power drives, suspensions, fire control devices, and so on. The gun has received a more generous share of the designer's attention, but, even so, the basic conception has not progressed far. Fundamentally, it always is the same kind of layout, with a highly conventional fighting compartment and crew disposition.

Thus, in general, the tendency of designers over the last 15 years has been to concentrate upon details; to study the problem piecemeal rather than to try and achieve a comprehensive and original idea of a tank as a complete entity; as a weapon of war with all its qualities in symmetrical balance. This comprehensive idea must be born in a designer's mind from the wealth of continuously accumulated experience. No staff specification can create the conception though it may provide stimulus.

Thus, the sterotyped conception of the form of the tank has become the chief factor which has limited the present-day designer. This limitation is one of his own creation because, when large guns and heavy armor were specified, he failed pitifully to retrace his steps and study the intrinsic problem from first principles.

What Are the First Principles?

Let us try and discover what these first principles are. As the demand increases for large guns with heavy ammunition and thick armor, then the *shape* and *arrangement* of the internal components dominate all other considerations. The largest weight item is the weight of the armor. Since the earliest days of the tank until the end of the last war, the weight of the armor has increased steadily from a relatively unimportant figure until now it is by far the most important proportion of the total weight. This increase is very significant, and a study of the method of applying armor should provide a good approach to the entire design problem.

Now, a sphere will enclose a given volume with approximately 20 percent less surface area than a cube, and the advantage of the sphere over an elongated rectangular box amounts to some 30 to 35 percent saving in area. The saving which the sphere has over a rough rectangular structure such as a tank hull is, at the very least, 50 to 60 percent.

Thus, it is clear that, in order to reduce the weight of the armor of a tank for a given enclosed space and armor thickness, or to obtain the maximum protection for a given enclosed space and total weight, the vehicle should be spherical. Let us now try and conceive an idealized vehicle on this basic principle, in which the upper hemisphere carries the gun and rotates on the lower hemisphere carrying the tracks and the propelling mechanism. Practical considerations at once begin to operate; the railway loading limit dictates about 125

inches maximum width and, almost inevitably, the power plant and drive must go in an armored compartment between the tracks to the rear. The remaining sphere for gun mounting and crew can be fitted comfortably within the 125-inch limit and will permit room for a large gun breech, a good ammunition supply, and at least four men. If we now make one of these men a driver, the entire present front driving compartment on the ordinary tank can be removed. (On the conventional tank, the front driving compartment costs many tons in weight.) Further practical considerations will modify the sphere until it approximates to the shape of an oblate spheroid. Figure 1 is a photograph of a small wooden model which indicates the kind of shape which might logically be developed.

The Problem of the Driver

It is necessary to position the driver so that he has a clear view through an opening in the turret roof and also through an alternative armored optical device. In order to compensate for the rotation of the turret, the driver will have to have a special seat which is revolved by a mechanism driven in reverse from the turret traverse rack so that he always faces forward whatever the position of the turret. The driving controls will have to be carried through the axial center of rotation of the turret; and this can be done by a simple mechanism on lines illustrated in Figure 2.

The criticism most certainly will be made that the driver, located in a rotating turret, will find his control of the tank impaired. This is improbable, for when the driver concentrates on the business of driving, he will cease to be aware that the turret may be rotating. It is certain that the improved view of the ground will be of the greatest help. On roads, under difficult conditions of traffic, the turret would not be revolving, and no difficulty could then arise. In the case of self-propelled artillery, the arrangement for having the driver in the turret has decided attractions. In this case, heavy armor is not normally a requirement; the big saving in weight, therefore, will permit the installation of larger guns

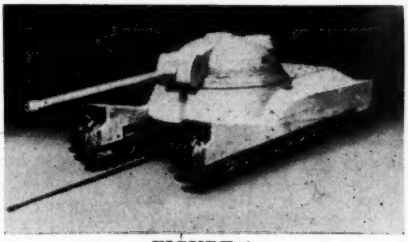

FIGURE 1.

and a greater quantity of ammunition. There also would be the great advantages of increased fighting space and more effective control.

Cast Armor Gives the Best Shape

In order to secure maximum simplification and the best possible shape for the armor, it should be produced as a casting. The vehicle might well be built of three such castings, comprising turret, fighting compartment, and power plant compartment. The last two could be flanged and bolted together to produce a complete hull of enormous intrinsic strength. No internal hull bracing would be required, an item which is so wasteful of space and weight on the conventional vehicle.

The turret casting would be designed to embody suitable housings for the gun mounting, sights, commander's and driver's vision cupolas, and radios. Similarly, the hull castings would be designed with housings for the suspension and registers for the turret support.

Let Us Learn From Experience

Tracks and suspensions, and those internal mechanisms which support and drive the turret and control the gun mounting, are major sources of weakness

in any tank. Battle experience has proved that they must be kept as low as possible in order to be inconspicuous and safe from attack. For example, the shock from the impact of a heavy armor-piercing projectile, even though it may not penetrate the armor, can render an elevation gear

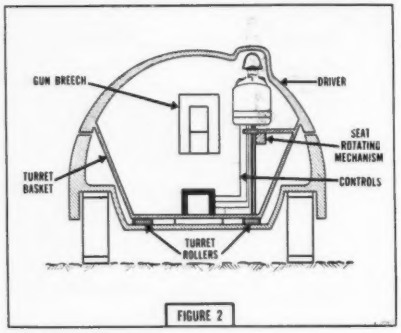

FIGURE 2

useless. Yet, elevation gears are still installed high up, with housings on the turret walls, where the danger from shock is at its greatest.

In the model illustrated, the tracks are shown depressed below the central horizontal plane of the fighting compartment. In this way the full width of the vehicle (125 inches, less the armor thickness) is available as fighting space around the gun breech, combined with the greatest safety for the tracks and suspension. If the 125-inch railway loading gauge is disregarded, larger fighting compartments with still larger weapons are feasible.

It is suggested that the *Churchill* type of suspension is the ideal for a heavy machine. It has the advantage that the vehicle can keep going even when several units have been shot away or otherwise damaged.

It is proposed that the turret should be supported centrally from a position between the floors of the fighting compartment and hull. Here, also, would be located the traverse mechanism, safe from attack.

A Criterion

Briefly, then, it is suggested that armored fighting vehicle design should start with gun, crew, stowage, and controls. When the optimum arrangement has been obtained for these, the armor should be wrapped around it as nearly as possible in the shape of a sphere. We still are left with the power plant compartment, and the cost of armoring this is very great.

It may be suggested that the finished design will not greatly resemble a spherical shape. This is agreed. The object of the writer in the present analysis is to seek a new approach to the design problem and to define a criterion. The spherical principle establishes this criterion.

The logical conclusion which now emerges is that the conventional driving position can no longer be retained. The crew members must be assembled as closely together within the armor as practical considerations of fighting efficiency will permit. Although it may be necessary to depart a great deal from the spherical principle in designing the armor protection, the designer should keep it firmly in mind as it is a true guide to the best possible shape.

Why Not Electric Propulsion?

Gasoline or Diesel-electric propulsion offers many attractive possibilities and should be examined much more closely. Electric machines are built almost entirely of copper, iron, and steel. It is not inconceivable that the armor steel of the power plant compartment might be designed in such a way as to form also the magnet frames of the generator and traction motors. Then the armatures of the electric machines would revolve in the armor itself and a very compact layout should be possible.

Electric power drives have attractive qualities which will help in the search for optimum grouping. For example, we

might locate the engine and generator at the front, with the traction motors at the rear. The power cables from the generator to the motors would pass under the fighting compartment. With such a layout, the hull might be a single armor casting on simple lines, with a shape approximating very closely to the ideal in accordance with the principles outlined. Figure 3 is a sketch of the kind of vehicle shape which might be developed.

Simplicity of Electricity

Electric propulsion has the great advantage of simplification of driving controls. In fact, alternative controls could be provided very easily so that in an emergency—for example, if the driver were a casualty—the commander could assume immediate control until the injured driver was replaced by another crew member.

Electric power drives have great flexibility both forward and in reverse. If the driver were in the turret, the tremendous advantage of this flexibility can be exploited fully. For example, a tank could be designed which would have an equally effective performance forward or backward. With electricity, controls are so simple, and the advantages of flexibility so great, that, once the principle of electric propulsion is accepted, placing the driver in the turret becomes an obvious necessity.

One other point in favor of electricity is the tremendously reliable nature of the equipment. Electric machines probably possess a higher standard of reliability than any other form of power plant. Again, electric design lends itself most readily to speedy replacement of components and assemblies. A unit system of design could be evolved which would allow quick replacement of assemblies so that in the event of damage, a complete power plant could be replaced quickly as a single unit. If electric propulsion is adopted, the design of a tank which can be rotated about a vertical axis by the simple means of driving its track in opposite directions becomes a straightforward engineering problem.

Advantages Claimed

The advantages which seem possible with this new method of design may be summarized as follows:

1. Removal of the front driving compartment, combined with a nearly spherical shape, will permit increased protection even with existing weapons and mechanical components, besides giving the best possible protection against armor-piercing projectiles.

2. By putting the driver in the turret, better driving vision and more effective control should be possible. Moreover, by having the driver so close to other members of the crew, morale will be improved and he can be replaced quickly if he becomes a casualty.

3. The simplification of shape allows the greatest possible fighting space, and results in an enormous increase in structural strength, particularly if cast armor is used, because then no space need be wasted on internal structural bracing members.

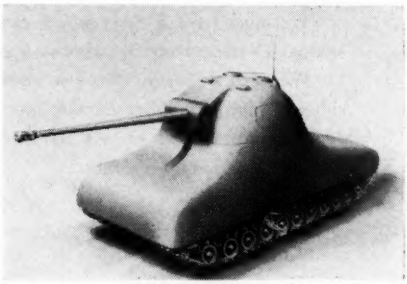

FIGURE 3.

4. The method of design allows a low silhouette, and if the depressed track is used the silhouette will be very low indeed, while elimination of the front hull driving position allows great scope for

optimum grouping of mechanical components. In addition, many attractive design possibilities emerge when the electric transmission is considered.

5. It is believed that this method of design will permit a large increase in the fighting qualities and allow a substantial gain in tactical advantage over a potential enemy. No such gain is possible on conventional lines.

If we, as a nation, are to assume leadership of the free world, we must, in my judgment, have armed forces in being which permit us to make our will felt wherever our interest is threatened.

We must have an Army with forces in being for early commitment and an adequate mobilization base for the forces required to make the final conclusive effort in any war.

We require an Air Force composed of both strategic and tactical aviation, with planes ready for take-off, not in the minds of designers.

We must have a Navy which can control the seas and project sea power against the enemy with ships and aircraft at sea—not in moth balls.

We need a Marine Corps of combined arms—ground and air—which provides a highly mobile, amphibious trained force in readiness for instant deployment. Recent events have proved the need for these requirements beyond a shadow of a doubt.

General Clifton B. Cates

The Possibilities of Employment of the Air Force of a Small State

Translated and digested by the MILITARY REVIEW from an article by Wing Commander B. St. Rainsborough in "Flugwehr und -Technik" (Switzerland) May 1951.

THE purpose of this article is to present a few of the problems that the air force of a small state will have to face if it fulfills its assigned task in case of hostilities. The solutions to such problems, however, must never be based solely on observations and experience. Therefore, the views expressed here should not be, and are not to be, regarded as unconditional solutions. They are, however, views which have taken form as the result of 7 years of war experience in the air.

An Integral Part of Ground Forces

The first and most important point that must be remembered is that a small air force must be an integral part of its own ground forces. In the case of the Swiss Air Force, all air formations should represent the counterpart of the Royal Air Force's Army Co-operation Command. This command was only a small part of the total British air force, and had as its sole task co-operation with the Army—or, to be more correct, support of the ground forces.

Functions of Small Air Forces

The pilots of these units were the eyes and ears of the Army. They assisted the ground forces by observing for them, giving them close support, and directing artillery fire. None of these functions can be neglected by this type air force.

In larger air forces, missions of a strategic nature, as well as of a long-range tactical nature, are turned over to other air formations. Therefore, in the Royal Air Force, we had, in addition to the nonflying commands, the following independent commands: Fighter Command, Bomber Command, Coastal Command, Transport Command, and Tactical Air Force.

Seeking a Solution

In an air force which is already small, any splitting up of forces similar to those mentioned above would be a dissipation of strength and a dispersion of striking power. Moreover, to expect one unit to fulfill all the missions mentioned above would be impossible from the human, as well as the matériel, point of view.

Therefore, the only solution that can be reached is to have a small air force assume all the missions of an army co-operation command, and omit all other missions.

Questions To Answer

If the assumption is correct that such an air force is to be regarded only as an army co-operation command, then the following questions must be asked:

1. What knowledge and ability must the flying personnel possess in order to fulfill their assigned missions successfully? That is, what training must be offered the pilots and observers in order that they will be able to understand and solve the problems of the ground unit commanders?

2. What form of ground organization must be established in order to obtain the greatest striking force without jeopardizing the continued existence of the flying formations? That is, how can we obtain the greatest possible exploitation with the least possible risk?

3. What is the best matériel for this force?

Qualifications and Training

On the basis of war experience, a great deal can be said in regard to the first question. Army Co-operation Command pilots, wherever possible, were selected from ground force units. Such is an ideal

situation, for when qualified army personnel can be trained for flying duties, they can understand fully the problems of their comrades on the ground, and, as a result, give the co-operation that will crown the combined actions with success.

Not all the pilots of the Army Co-operation Command had had previous army training. However, this difficulty was overcome, to a great extent, by conducting intensive theoretical training and participating in numerous combined (army and air force) maneuvers.

A Spirit of Teamwork

The pilots in such formations must have a personal interest in the ground forces which they are supporting. They must understand the language of their commanders, and be able to understand, in a few words, the tactical situation at any given time. Therefore, the training objective of such an air force should be theoretical and practical air tactics, together with ground tactics. As a well-known authority has said: "The future of the air is on the ground."

Air-Ground Organization

Finding an answer to the second question is a little more difficult. A precedent hardly can be found, and it would not be fitting to make plans here. In a war, the unforeseen always is the most important. Plans can be made for the foreseen; the unforeseen requires improvisation and initiative on the part of the individuals concerned. Here, again, training plays its part. Are the officers able to improvise? Are they able to use their initiative properly? Are they able to attack a problem without it being necessary to give it to them carefully transcribed? If these questions can be answered with a "yes," then the action of such a force will be crowned with success.

Mobility and improvisation are possible only when an air headquarters is located in the combat sector. To gain a better idea as to how a small force could be organized for combat action, the employment and location of the pilots of the Royal Air Force's Army Co-operation Command must be examined.

Air-Ground Liaison

The basis for joint action between air and ground formations always was "co-operation." For this purpose, an air liaison officer was attached to each division or independent brigade. This air officer, an experienced tactician, worked with the ground unit in all phases of the fighting. Based on the plans and needs of the ground unit commander, the air liaison officer determined the possibilities of air intervention. If he did not have air formations of his own available, he requested such formations from the corps air liaison officer. As soon as these formations had been assigned for a definite mission, the command authority over them was transferred to the ground force commander, with the division air liaison officer directing their actions. However, the corps was kept informed of pending employments, the forces engaged, and the results.

Every army corps had its permanently assigned air formation, which, in turn, was distributed among its divisions. The strength of these formations varied, depending on the combat situation in the air and on the ground. This air formation had three definite missions, and was divided into three groups:

Group 1.—Combat reconnaissance aviation.

Group 2.—Artillery observation aviation (assigned to the artillery units).

Group 3.—Liaison aviation.

Small Air Force Limitations

It is probable that a small air force would not have sufficient air formations under the control of an army corps to

permit forming the three groups mentioned above.

However, in addition to these three groups under corps control, there should be high-speed aircraft units under the control of the Air Force High Command. These planes would be used to counter enemy air action, and for close-support operations (under corps control), as well as for combat reconnaissance missions.

In order to ensure that the air formations have flexibility in operation, the commander of every air formation should be located in the combat sector with the ground forces. This will permit changes to be made in plans and orders, even at the last moment, and result in greater co-operation between the air and ground forces. In addition, the commander of every air formation should be subordinate to the ground force commander that his formation is supporting. This would make the air forces an integral part of the ground forces and would result in greater teamwork and co-ordination.

Maintaining Strength and Economy

Every ground force commander, air liaison officer, and air formation commander must "ration" the planes and personnel at their disposal. Employment and employment risks must be based on the daily loss figures. It often will be a difficult decision for a pilot to make, that is, to withdraw from a fight with an enemy air formation in order to conserve his own air strength. Air formations should be employed only in sectors where there will be the least interference from enemy air forces. Thus, the pilots must complete their missions with the greatest speed, in order to leave the sector before they can be detected by enemy air formations.

The importance of maintaining an air force in wartime is so great, that the combat air forces of a small country must take care not to let themselves be drawn into a major air battle with an air force belonging to a major power.

Matériel Problems

As regards the third question, it would be very difficult to give a detailed answer. A small air force should have planes that have great mobility and fire power, and they should be capable of taking off and landing in small areas. Armament should place emphasis on ground-support missions and not on aerial combat. Finally, the planes should be equipped with efficient radios with a radio detachment assigned to each air unit.

In conclusion, it should be emphasized that this article is based on purely personal views. However, if it constitutes a basis for further discussions and views by specialists, pilots, or commanders, it will have fulfilled its purpose.

Snow and Ski Warfare School

Digested by the MILITARY REVIEW from an article by Lieutenant J. C. Gorman in the "Australian Army Journal" (Australia) February 1951.

DURING February 1950, the British Army of the Rhine conducted a Snow and Ski Warfare School at Altanau, in the Harz mountains of Germany. The course was just over a month in length and students were drawn from all arms and services. The school essentially was for novices, the vast majority of whom had never before strapped skis to their feet.

Object of the Course

Envisaging a modern war that would be world-wide, the General Officer Com-

manding, Rhine Army, decided to take advantage of the local snow conditions, and of the Norwegian Army officers in the British zone, to train selected officers and men in snow warfare. The British Army has done little research into Arctic warfare, leaving the Empire contribution mainly to Canada. The trained men from the school would form a pool of semi-skilled ski instructors, and, more important, snow warfare instructors, should the British be called upon to provide ski troops in a future war.

The School

Altanau is a small German village in the Harz mountains. Typically German, it boasts an ice-bound main street and a cluster of wooden, two-story houses. The entire area is pine forest, interspersed with long slopes of deep snow.

A British major was commandant, with a Norwegian major as chief instructor. A Norwegian captain was assistant and eight Norwegian lieutenants were squad instructors. All spoke excellent English.

The Norwegian Army issued a pair of skis, ski boots, and poles to each man, and the British Army issued the rest of a complete outfit.

Ski Training

Clad in camouflage suits and carrying skis, the squads assembled on the snow, and ski training began. Ski poles were piled, and their use forbidden for 3 days. The instructors were highly skilled, patient, and gave every man personal attention. From wild uncontrolled slides, the students gradually gained control of their skis. Confidence soared when the simple brakes had been learned. It was emphasized that if one lost balance, the thing to do was to go limp and fall. This was a most effective move as there was not one casualty over the entire course—an all-time record for Army ski schools.

At night, films were shown, and ski techniques criticized by the instructors. They were mostly American films, and the Norwegians used them mainly to show what was wrong. They scoffed at the use of climbing skins, at the American techniques and equipment, and impressed their own ideas upon the students.

During the second week, rifles were carried slung across the back at all training. By the third week, the students were capable of long marches, swift twists and turns down mountain trails, and generally confident in their skiing ability.

At night, the students had "Sauna" baths. Entering a small room, they sat naked for 15 minutes in thick steam, produced by a roaring steel brazier, on which water was poured. Emerging dripping with sweat, they would have to jump into a tank of icy water, which, strangely enought, did not feel very cold, and then roll in deep snow, rub down with snow, toss a bucket of cold water over one another, and towel dry. It is a famous Swedish bath, and most invigorating.

When the students could ski sufficiently well, fieldcraft training began. Clad in white, patrols stalked each other, and ambushed other patrols. Personal camouflage, small arms training, care of arms in the snow, and field firing were covered. Students learned how to estimate the number of troops who had used a trail. In addition, the students learned to counter these identifications.

Practice camps were held, Swedish tents erected, and supply practiced. Sanitation, hygiene, evacuation of casualties, first aid to the wounded, care of troops, care of feet, and long route marches were taught. At the end of the third week, the students' skiing technique was good. The warfare training was completed, and the final week was given to snow maneuvers, to put into practice all that had been learned.

Conclusion

Students who completed the course received a diploma as trained ski troops and

the proficiency badge of the trained Norwegian ski trooper.

The object of the course undoubtedly had been achieved. The students were most enthusiastic to attain greater proficiency, and several applied for, and were assigned to Alaska for more advanced Arctic warfare studies under the Canadians.

In Australia, the general military thought, mainly, is directed toward "normal" and tropical warfare. It is well to remember that there are many other types of specialized fighting, of which snow warfare may be a very important one in the next war. Britain has begun to realize that fact, and the Rhine Army Ski and Snow Warfare School was a beginning toward training men to fight in extreme cold.

Arnhem Aftermath

Digested by the MILITARY REVIEW from an article by Lieutenant Colonel R. E. Black in the "British Army Journal" (Great Britain) July 1951.

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THIS is the story of a sequel to the airborne operations at Arnhem, told mainly from the point of view of the engineers who took part in it. It was a comparatively small operation and little was heard of it, for reasons which presently will be obvious.

There came a stage in the magnificent struggle of the 1st Airborne Division, when it was realized that it could not humanly hold on much longer and that the XXX Corps, advancing from the south, would not be able to link up with it. Accordingly, it was ordered to withdraw from Arnhem; and during the night of 25-26 September 1944, many were able to get away across the River Neder Rijn, to join up with the XXX Corps which had a slender hold on part of the southern bank. It was inevitable, however, that some, with whom contact had been lost by the confusion of battle, should be left behind. Those with ammunition remaining were no doubt still continuing the fight, but the chances of any of them avoiding being killed or captured were small. Nevertheless, nearly a month later, hope for them was unexpectedly revived.

On 19 October, one of those left behind, the commanding officer of a parachute battalion, managed to return across the river somewhere below Arnhem, bringing news of others who had avoided capture. They were "lying low" in and about the town, with the aid of courageous Dutch who fed and sheltered them. Furthermore, they were in touch with each other, and, though some were wounded, all the fit had managed to retain or acquire a weapon and ammunition.

Resurgence or Rescue?

The parachute battalion commander brought certain proposals, either for the fighting resurgence of those in hiding or for their withdrawal. However, it was decided that the latter proposal, a rescue, must be effected.

By then, several miles of the southern bank were in allied hands, the left of two sectors being held by the American 101st Airborne Division. It was decided to establish a bridgehead across the river in this sector and to ferry back as many of those in hiding who could find their way to it, fighting only if necessary.

This was to be done at night during

the few hours of real darkness, and the task was entrusted to an American battalion and the 210th Field Company, Royal Engineers, of the XXX Corps.

Below Arnhem, the Neder Rijn is 500 yards wide and flows with a strong current. The northern bank, which was entirely in enemy hands, rises sharply from the river, giving extended observation across it to the south, over a flat and waterlogged expanse which lies between the Neder Rijn and the Waal. Geographically, the enemy had much the best of it.

Planning the Operation

There was some tendency for preliminary planning to fall between the two considerations of stealth and force, but it soon emerged that the best hopes lay with the former, and from that moment the sound maxim prevailed that an absolute minimum of men and materials should be engaged. (It was made clear that even interested senior officers with a predilection for appearing in tight corners would be unwelcome.)

Once the general outline of the operation had been agreed, it was noticeable how quickly the American commanders passed the planning down to the man who actually had to do the job, and on the British side, too, the field company commander was treated similarly.

The crossing was to be made 5 or 6 miles downstream from Arnhem. Some 24 boats, each manned by a crew of 4 were to be used, with an additional 6 boats and crews in reserve on the home bank. Of the 24 to cross, 18 were spaced 5 yards apart while the others were "flankers," 3 at each end with 50 yards between each boat. Thus, the frontage covered was nearly 400 yards, with the center opposite the rendezvous named by the parachute commander in his proposals. The wide frontage obtained by use of the flanking boats was adopted in case any of those to be rescued failed to arrive at the exact rendezvous, no easy task after traversing miles of wooded and enemy-held territory at night. There was a margin of carrying capacity for the hundred or so who were expected.

The "bridgehead" was to be formed by no more than an American fighting patrol, six or seven strong, on each flank, and these were carried in the two outer boats of the central 18.

A boat in the center carried the over-all commander—the parachute commander—and with him were the commander of the Americans and a forward observation officer. A considerable number of guns were in readiness in case stealth failed and the fighting became intense. In another central boat was the Officer in Command, 210th Field Company, and there was a telephone boat, of which more anon.

Owing to the few hours of real darkness, and allowing for approach and withdrawal, less than 3 hours could be spent at the river. The rendezvous was listed for 2359 on 22 October, but all was to be ready on the near bank about an hour in advance of this, in case any of the escapers ran into trouble and had to make a run for it. How the rendezvous and other essential information was passed to those across the water the writer does not know, though he has every reason to believe that it was telephoned into Arnhem from allied territory.

It will be seen that little time was allowed for staging the performance, but a stealthy reconnaissance was made of the southern bank, while the engineers rehearsed the silent carrying of boats for long distances, and also paddling them in strong currents. There was a final rehearsal on the River Maas with the Americans.

To limit activity on the vital night, the boats were taken by truck during the previous night as far forward as could be risked without being seen by the enemy. They were concealed at Randwyk in a

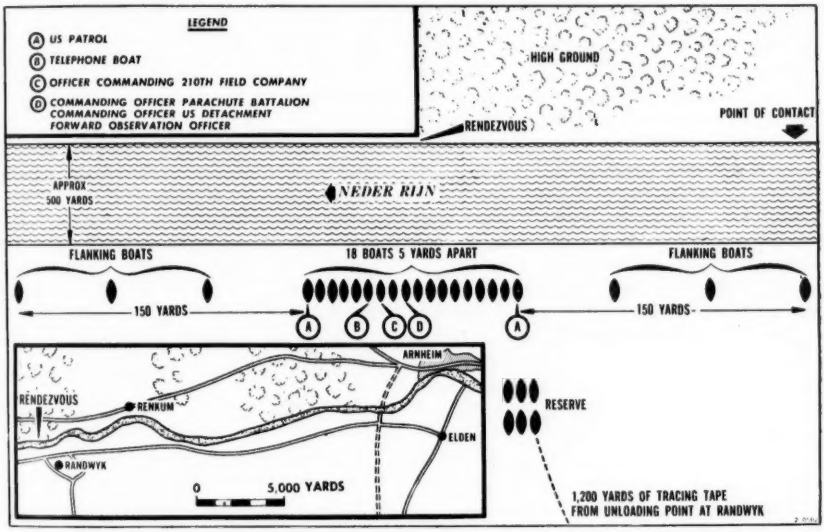
group of buildings from where they subsequently had to be manhandled some 1,200 yards to the river. A tracing tape was laid in advance to mark the route. Anyone who has helped to carry an assault boat will appreciate what that carry meant; a boat weighs 350 pounds and they had to be carried silently, in two shifts of 15 each, so the journey was made twice.

In due course, on the night of 22 October, the engineers, with blackened faces and dressed in denims, canvas shoes, steel helmets, and life jackets, arrived by truck at the boats, and the long carry began.

By 2315, all the boats and their crews were distributed in position along the bank at about 80 yards from the water's edge, under the cover of an orchard. On the allied side of the river, all was quiet, but from across it came the sound of mortars and field guns. Away to the east a factory burned.

Eyes were strained watching for the prearranged torch signals from the opposite bank when, shortly before midnight, the sounds of small-arms fire were heard from somewhere in the woods across the water. Only a few shots were fired, and it was a great relief when no more followed. Later, the shots were identified as the liquidation of an inconvenient German patrol.

At 2400, a Bofors gun fired two bursts of tracer directly overhead. This had been prearranged as an "aid to navigation" for those trying to find their way through the woods to the rendezvous. A somewhat similar performance with the Bofors weapon had taken place during the previous 2 nights so that no particular suspicions should be aroused.



The Signal To Cross

At 0007, a signal from the opposite bank was seen, but it appeared several hundred yards upstream from where it was expected. That it was spotted at once was due to forethought in placing the flanking boats well out. Without this precaution, the signal might have been missed and, at best, precious time wasted. At once the word was passed and each crew

stood up, carried the boats quietly to the water, and started to cross. Some, in their anxiety to make as little noise as possible in paddling, were carried by the strong current some 50 yards off course. On arrival on the other side, these boats had to be hauled upstream by men walking on the bank, a process which proved none too easy in canvas shoes on slippery ground. The only other trouble occurred with the telephone boat, from which a signals line was paid out as it crossed so that a shore-to-shore telephone line might be established. The powerful current, however, caused too great a drag and the line finally had to be jettisoned, but there were, of course, radio links. It might be mentioned here that the Americans had "walkie-talkie" sets.

Within 23 minutes of the receipt of the signal from across the river, every boat was in its allotted place on the far bank. About 5 minutes later, the first of those to be embarked arrived, having been guided downstream by the flanking boats.

Room for All

Embarkation began at 10 passengers for each boat, but when it was learned that there were "about 150" of them, the load in some boats was increased. All might have been fitted in without calling on any boat for a second trip; though, in fact, one boat did make a second trip. There proved to be 138 escapers, including a number of wounded. Just before 0100, word was given for the American patrols to withdraw. Within 15 minutes, every boat had reached the home bank safely.

It had never been intended to carry the boats right away, but to conceal them as far as possible at a short distance from the river, to be surreptitiously collected later; one carry was quite enough for that night. Even this less demanding plan had to be modified, as by this time, the enemy evidently had become aware that something was happening.

Some flares went up and illuminated the area which so shortly before had been the scene of embarkation, while more flares went up over the river—there obviously was no time to lose getting clear. Hiding the boats became a rather hurried operation and soon everybody was well away, so it could not be determined when the fire did come down on the south bank. However, it was obvious from the number of boats found with bullet holes, when they were recovered a night or two later, that when it did come down it was pretty heavy.

What conclusions the Germans may have come to is not known, but doubtlessly they did not conclude that 138 valuable fighting men had been whisked away from under their noses.

An important factor in the success was that a minimum number was employed, a vital matter in any operation of this type. Things were not, however, cut so fine as to leave no margins, as witness the supposedly spare carrying capacity.

Another factor was that allied co-operation, fortified by the combined rehearsal, was completely smooth, while the fact that as much planning as possible was left to those who had to do the job was a noticeable feature. They made their plans and preparations with meticulous care; on such occasions even an untied shoelace may lead to a fall, a fall to a noise, and a noise to anything.

The Maintenance of Military Secrecy

Translated and digested by the MILITARY REVIEW from an article by Colonel Achard-James in "Revue Militaire d'Information" (France) 10 April 1951.

THERE are very few fields in which the maintenance of secrecy is not an element of success. In fact, it is often the leading element of success.

Secrecy has a value of its own and one of its primary consequences is surprise. This often makes an action 10 times more effective than it would have been otherwise.

Whether it be in domestic or foreign matters, a nation cannot conduct its affairs without secrecy.

National Defense Affects Everyone

Today, national defense reaches into all fields and all walks of life. Nearly everyone participates, in one way or another, in national defense and is aware of information pertaining to secret matters. Respect for secrecy seems to exist in the majority of the foreign countries. However, is this the result of patriotism or of an imposed discipline?

It is a curious thing, but, even in France, a person who is very discrete in his private activities often is incapable of keeping to himself things that he has learned in his official capacity, whether civil or military. It is not difficult to recall, within the not too distant past, the surprising leaks that have occurred after secret committee meetings—leaks which have divulged secret information in the military field.

A Complex Problem

As regards this matter, unfortunately, a "why worry" attitude prevails. When a breach in security occurs, there is a switch over from total indifference to extreme measures. However, dominated by experimentation and of short duration, such measures usually have had no effect. The tendency seems to be to apply remedies as though the problem were a simple one. An analysis of the problem, however, will show its complexity.

What material is involved in a leak of secret information? Obviously, data which should remain concealed from the enemy. It may deal with equipment, forces, organization, methods, movements, actions, morale, means, or the efforts which have been or are being made to solve a particular problem. Therefore, it is obvious that one solution or measure will not apply to matters of such a varied nature.

Two Categories of Classified Information

Classified military information can be considered as falling into two categories. The first category includes information on things or events which exist at the present time; that is, equipment presently in use, a movement in execution, or an action in operation. The second category includes information on things or events which do not exist at the present time, but which will exist in the future; that is, equipment which is in the process of manufacture or development, and actions or movements which are contemplated.

How will the enemy learn about something which we are attempting to conceal from him?

Information falling in the first category is learned most often by direct observation; information in the second category by conversations and documents. Therefore, differences exist in the methods of securing information, differences which condemn abusive generalizations.

Concealment from the enemy of existing facts, or of facts which are harbingers of future developments or events, poses many varied problems. However, these problems are relatively simple, and they can be solved by such measures as

the executing of movements at night, the camouflaging of vehicles and equipment, and the employing of smoke screens.

The battle against the unwitting release of information is a problem which merits special attention. Generally, after such an incident, disciplinary action is recommended. However, it seems more logical to study the reasons for the unwitting release of information, and then to attack them systematically.

Ignorance a Major Factor

One of the most important causes is ignorance. This is the result of a lack of appreciation of secrecy in general. Even knowing the importance of secrecy, it frequently happens that all the desired precautions are not taken to hide information from the enemy—papers are left lying around, or conversations are held in public. Ignorance also is manifested in such forms as imprudence, negligence, or abuse of confidence.

In the face of such a variety of causes, it would be wrong to adopt a single solution or measure for the problem. Each case must be attacked separately.

Security Instruction Required

The battle against ignorance is a matter of instruction and education. In *Mein Kampf*, Hitler wrote: "A nation is not able to do anything great if its individuals are not able to keep a secret." He realized that the education of children would have a great effect on the unwitting disclosure of information.

However, it is not possible in France to impress the educators with this fact. But this education and instruction must be undertaken as soon as the recruit arrives in the Army.

Methods of Conducting Instruction

As in all instruction, training can be conducted in two ways, namely:

1. *The informational method.*—Personnel must be made to understand the importance of secrecy by illustrating the relationship between the unwitting release of information and subsequent enemy action.

2. *The propagandistic method.*—Personnel must be made to realize the importance of secrecy through the use of posters or slogans.

The most effective type of poster or slogan is one which illustrates the connection between the unwitting release of information and subsequent enemy action. For example, a poster showing a soldier disclosing information and then being killed, afterward, in an ambush creates a psychological effect illustrating that the unwitting disclosure of information results in death. On a mind thus prepared, posters or slogans produce an effect.

Instruction Must Be Continuous

Instruction must be carried on constantly. It must be pursued with the same attention as daily physical instruction.

As a rule, a Frenchman is not very suspicious. He quickly estimates the personnel around him as being trustworthy. He takes no precautions against the possibility of someone overhearing conversations in his office or command post. He allows documents to lie around, talks with the doors open, and does not take even elementary precautions. The battle against the unwitting release of information must include continual surveillance, by the military security agencies, of the personnel employed in the offices and command posts, as well as measures for safeguarding files and documents, the destruction of preliminary drafts, and security measures at places where secret matters are conducted.

Reflexes Must Be Greater

The Security Service maintains surveillance over the military in public places; however, surveillance is not suf-

ficient to solve the problem. Reflexes must be created; reflexes against carelessness and unwarranted trustfulness. This is repugnant to the French temperament, but the situation demands it.

A complete education is required in creating these reflexes. Closing the door before working with classified material must become a habit. Maintaining a check over one's words and actions likewise must become automatic.

Severe Penalties Required

The penalty should be severe against breaches of security discipline. The consequences are too serious to be tolerated. The release of information because of a breach of security discipline must be regarded as true treason. The battle against treason is, first, a matter of surveillance, and, then, of military justice.

However, the battle against the unwitting release of information is, perhaps, the most difficult one. Personnel who continue to release information, even though it is without intent, must be eliminated from positions where they will come in contact with classified information.

Action against offenders who unwittingly release information is far from being simple. It is, likewise, far from being immediate in its effect.

With education being carried on systematically, penalties and other methods of control will be required less frequently. Nevertheless, there always will be leaks, but risks must be reduced to a minimum.

Controlling Military Security

Often, large groups are briefed concerning future operations in which some classified information is presented. It is obvious that the larger the group, the greater the risks of having information released unwittingly. Therefore, each person should be told only what concerns him, and he should not be given such information until he is required to know it. Such a system would have several advantages. It would be easy to determine who had been given information, and the amount of information each person had been given. This system also would make it easier to modify plans if the enemy has been able to obtain some of the information which has been given out.

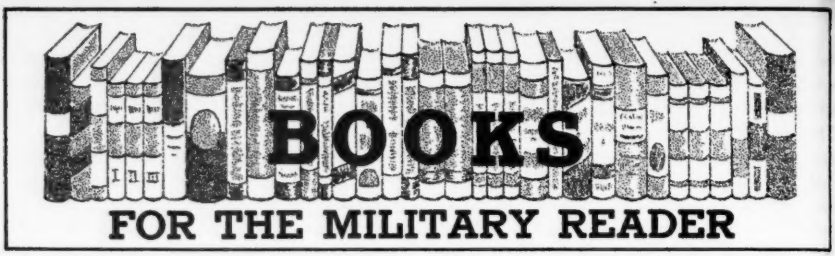
The dissemination of classified information to persons who must have a knowledge of such information must be accompanied by instructions fixing *what* information he may release, *who* he may release it to, and *when* he may release it.

In addition, classified documents should be printed or written on paper of a special color, each color corresponding to the degree of classification they bear. This would make it easier for personnel to realize the degree of classification borne by a document, and would give greater weight to its security classification than the words "secret" or "top secret."

Summary

This study is not complete, for all aspects of the maintenance of military secrecy have not been included. However, it was my intention to prove only that the matter of military secrecy is not simple, nor subject to rapid solution.

The maintenance of secrecy requires effective instruction and severe disciplinary action. To achieve the best results, both must be long-term measures. In addition, each particular case requires individual study and appropriate measures for its solution.



TWENTIETH CENTURY ECONOMIC HISTORY OF EUROPE. By Paul Alpert. 466 Pages. Henry Schuman, New York. $6.00.

By CAPT WILLIAM H. BEAUCHAMP, *CE*

An intense preoccupation with the notion that Europe today is attempting to achieve a synthesis of political and economic democracy which will provide a guide to healthier economic and social developments for the other major areas of the earth prompted Mr. Alpert to produce this excellently written volume.

Many of his readers may not agree with the author in this basic notion but a vast majority of them will feel that he has done an outstanding job of covering Europe's economic development since the turn of the century in an interesting and readable manner. The book is aimed at the average reader, and, while it has its share of statistics, it is never tiresome.

The narrative centers around the four principal nations of Europe: Britain, France, Germany, and Russia and first summarizes their economic condition prior to World War I; and then goes on to study the effects of the war and the peace that followed. Next, the author follows each nation through the period of prosperity of the late 20s, the depression of the 30s, and World War II. Postwar industrial and financial problems, the Marshall Plan, and, finally, attempts at economic unification, that is, the Schuman Plan, felt so necessary by the author for the future of all of us, complete the story.

THE GENERAL WHO MARCHED TO HELL. By Earl Schenck Miero. 350 Pages. Alfred A. Knopf, New York. $4.50.

By CAPT JAMES S. EDGAR, *MPC*

This is a new historical narrative about William Tecumseh Sherman and his march from Chattanooga to the sea. The account is dashing and wordy, and yet gives a clear picture of the action, the people encountered, and of the times.

The reader will ride with the passionate, impulsive, red-headed General in the campaign through Georgia; march with the foot soldier of the North and the South who fought the battles; learn of the politicians who betrayed the common cause; see, with a 10-year-old girl's eyes, the agony of Atlanta; weep with a 17-year-old girl who saw a noble dream die; and live through the pillage and holocaust of Columbia. The wars of our day are poignantly reminiscent of this march to fame.

INDIA SINCE PARTITION. By Andrew Mellor. 156 Pages. Frederick Praeger, New York. $2.50.

CAREER AMBASSADOR. By Willard L. Beaulac. 262 Pages. The Macmillan Company, New York. $3.50.

SAGA OF THE XX "GHOST" CORPS. Prepared and written by XX Corps Personnel. 407 Pages. APO 317, c/o Postmaster, San Francisco, California. $5.00.

With Patton's Third Army in Europe during World War II.

ENGINEERS OF THE SOUTHWEST PACIFIC 1941-1945. Vol. VIII, Critique. Prepared by the Office of the Chief Engineer, General Headquarters, Army Forces, Pacific, and edited by Lieutenant Colonel George A. Meidling, CE. 451 Pages. US Government Printing Office, Washington, D.C. $5.75.

By COL GEORGE C. REINHARDT, *CE*

The immensity of a "critique" covering more than 400 pages is justified less by the encyclopedic seven volume history preceding it than by the enormity of the achievements that history records. Nowhere was World War II more truly "an engineer's war" than in the Southwest Pacific. That, despite ultimate success, there were lessons to be recorded, lessons that were learned the hard way, is not surprising. That so detailed a record, superbly illustrated with maps and action photographs, was compiled from contemporary sources in the heat of active service is a tribute to the perspective of the authors.

Researchers will revel in the wealth of material and its detailed presentation, though they may have to compile their own summaries for the many separate campaigns. Among the chapters devoted to these campaigns, the one on "Philippine Defense," during the Japanese invasion, supplemented by three appendices taken from contemporary official records, is especially noteworthy. It sheds light on a little known and much misunderstood struggle. Here, engineers began their wide diversity of duties, from foxhole to utilities, that distinguished the whole Pacific War.

This volume pulls no punches. "World War II in this theater might have been won even more efficiently, and possibly at an earlier date, if it had been possible to capitalize on many of the lessons learned in the early days of the conflict."

Photographic coverage mildly contradicts the author's criticism by depicting improvement in many of the logistic shortcomings, so evident in pictures of the early operations. A chronic shortage of engineer troops and equipment is recorded, however, not always the fault of theater allocation. Too often, engineers were "brought in late and without heavy equipment for high priority construction," which was particularly detrimental when airdrome and port construction held "as important a status in operations instructions as tactical missions."

Interesting to all logisticians is the passage attacking the "project system," accompanied by a constructive recommendation to substitute "quarterly estimates and reports," which, it is claimed, would furnish the Department of the Army adequate information and retain for it equal control without the prolonged delay in receipt of material.

In the field of intelligence, particularly in the collection of terrain data vital to task force engineers, Major General Hugh J. Casey, Chief Engineer, reports satisfactory improvement during the war. General Casey's final appendix, summing up the qualifications of the military engineer, is a fitting close to the story: "Among the first ones in and the last ones out, he must be rough, tough, and fast."

ASIA'S LANDS AND PEOPLES. By George B. Cressey. 597 Pages. McGraw-Hill Book Company, New York. $9.00.

A geography of the East.

USING YOUR MIND EFFECTIVELY. By James L. Mursell. 264 Pages. McGraw-Hill Book Company, New York. $3.00.

A plan of action for study-groups.

A HISTORY OF CANADIAN EXTERNAL RELATIONS. By G. P. Glazebrook. 449 Pages. Oxford University Press, New York. $4.50.

BRAZIL. Portrait of Half a Continent. By T. Lynn Smith and Alexander Marchant. 480 Pages. Illustrated. The Dryden Press, New York. $5.75.

By LT COL W. F. BOUCAS, *Brazilian Army*

This book is the work of not only 1, or even 2 individuals, but of 18 different authorities. Each (with one exception) has written a chapter, although the responsibility for the entire work rests with Professors Smith of the University of Florida and Marchant of Vanderbilt University.

The book is a veritable fountain of information on the sociology, anthropology, economics, geography, public administration, and history of the largest country in South America, affording the reader an opportunity to become better acquainted with his neighbors and friends to the South.

It must be noted that most of the data contained therein are based on the 1940 census, when, at the time of its publication, 1951, there already existed another, more recent and complete. For example, the population of Brazil is listed as 45 millions. In reality, however, it has reached the 53 million mark.

Further, the pictures listed in the first pages of the book are, in the greater majority, of the rear areas and, therefore, may give the reader an erroneous idea of this great country. For example, the aerial photograph of Rio de Janeiro is only 20 years old! As such, it does not represent the city, which, like young people, grows and changes in lightning fashion.

Despite its shortcomings, this book is a monumental step forward in providing interesting, factual data on a "good neighbor" to the South.

U.S.A. THE PERMANENT REVOLUTION. By the editors of Fortune. In collaboration with Russell W. Davenport. 267 Pages. Prentice-Hall, New York. $3.75.

OIL AND GAS PRODUCTION. Compiled by the Engineering Committee of the Interstate Oil Compact Commission. 128 Pages. University of Oklahoma Press, Norman, Okla., $2.75.

By LT COL WALTER L. SPAULDING, *QMC*

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